U.S. ARMY ENGINEER DIVISION
HUNTSVILLE, ALABAMA

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# FINAL

## PROPOSED PLAN FOR
## The FIRE TRAINING AND DEMONSTRATION PAD (SEAD 25) and the FIRE TRAINING PIT AND AREA (SEAD 26)

SENECA ARMY DEPOT ACTIVITY
ROMULUS, NEW YORK

CONTRACT NO. DACA87-95-D-0031
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# FINAL PROPOSED PLAN
# FOR
# THE FIRE TRAINING AND DEMONSTRATION PAD (SEAD 25)
# AND THE FIRE TRAINING PIT AND AREA (SEAD 26)

## SENECA ARMY DEPOT ACTIVITY
## ROMULUS, NEW YORK

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**September 2002**

**FINAL PROPOSED PLAN**
**The Fire Training and Demonstration Pad (SEAD-25)**
**and the Fire Training Pit and Area (SEAD-26)**
**Seneca Army Depot Activity (SEDA)**
**Romulus, New York**

**Table of Contents**


1.0 PURPOSE OF PROPOSED PLAN ..... 1

2.0 COMMUNITY ROLE IN SELECTION PROCESS ..... 1

3.0 SITE BACKGROUND ..... 2

4.0 REMEDIAL INVESTIGATION SUMMARY ..... 2

4.1 SEAD-25 ..... 2

4.1.1 Soil ..... 3

4.1.2 Surface Water ..... 3

4.1.3 Sediment ..... 3

4.1.4 Groundwater ..... 3

4.2 SEAD-26 ..... 3

4.2.1 Soil ..... 3

4.2.2 Surface Water ..... 4

4.2.3 Sediment ..... 4

4.2.4 Groundwater ..... 4

5.0 SUMMARY OF SITE RISK ..... 4

5.1 Human Health Risk Assessment ..... 4

5.1.1 SEAD-25 ..... 5

5.1.2 SEAD-26 ..... 5

5.1.3 Additional Information on SEAD-25 and SEAD-26 Human Health Risk Assessment ..... 6

5.2 Ecological Risk Assessment ..... 6

6.0 SCOPE AND ROLE OF ACTION ..... 7

7.0 REMEDIAL ACTION OBJECTIVES ..... 7

8.0 SUMMARY OF REMEDIAL ALTERNATIVES ..... 7

8.1 SEAD-25 and SEAD-26 Remedial Alternatives ..... 8

8.1.1 Alternative RA25-1: The No-Action Alternative ..... 8

8.1.2 Alternative RA25-2: Institutional Controls, Natural Attenuation of Plume ..... 8

8.1.3 Alternative RA25-3: Bioventing of Soil and Air Sparging of Plume ..... 9

8.1.4 Alternative RA25-3A: Bioventing of Soil and Natural Attenuation of Plume ..... 9

8.1.5 Alternative RA25-4: Source Removal, Off-site Disposal, and Long-Term Monitoring of Plume ..... 10

8.1.6 Alternative RA25-5: Source Removal, Off-site Disposal, and Air Stripping of Plume ..... 10

8.1.7 Alternative RA25-6: Source Removal, Off-site Disposal, and Air Sparging of Plume ..... 11

8.1.8 Alternative RA25-3R: Bioventing/Air Sparging/ Sediment Removal -Residential Alternative ..... 11

8.1.9 Alternative RA25-3AR: Bioventing/Natural Attenuation/Sediment Removal – Residential Alternative ..... 12

8.1.10 Alternative RA25-4R: Source Removal/Off-site Disposal/Natural Attenuation/Sediment Removal – Residential Alternative ..... 12

8.1.11 Alternative RA26-1: The No-Action Alternative ..... 13

8.1.12 Alternative RA26-2: Institutional Controls and Monitoring of Plume ..... 13

8.1.13 Alternative RA26-3: Air Sparging of Plume ..... 13

8.1.14 Alternative RA26-4: Air Stripping of Plume ..... 13

9.0 EVALUATION OF ALTERNATIVES ..... 14

9.1 SEAD-25 ..... 14

9.1.1 Overall Protectiveness of Human Health and the Environment ..... 14

9.1.2 Compliance with ARARs ..... 14

9.1.3 Long-Term Effectiveness and Permanence ..... 14

9.1.4 Reduction in Toxicity, Mobility, or Volume ..... 15

9.1.5 Short-Term Effectiveness ..... 16

9.1.6 Implementability ..... 16

9.1.7 Cost ..... 16

9.1.8 State Acceptance ..... 17

9.1.9 Community Acceptance ..... 17

9.2 SEAD-26 ..... 17

9.2.1 Overall Protectiveness of Human Health and the Environment ..... 17

9.2.2 Compliance with ARARs ..... 18

9.2.3 Long Term Effectiveness and Permanence ..... 18

9.2.4 Reduction of Toxicity, Mobility, or Volume ..... 18

9.2.5 Short-Term Effectiveness ..... 18

9.2.6 Implementability ..... 18

9.2.7 Cost ..... 19

9.2.8 State Acceptance ..... 19

9.2.9 Community Acceptance ..... 19

10.0 PREFERRED ALTERNATIVE ..... 19

10.1 SEAD–25 ..... 19

10.2 SEAD-26 ..... 20

GLOSSARY ..... 22

## LIST OF TABLES


| Table Number | Description |
|---|---|
| 1A | SEAD-25 Surface Soil Analysis Results |
| 1B | SEAD-25 Surface and Subsurface Soil Analysis Results |
| 1C | SEAD-25 Groundwater Analysis Results |
| 2A | SEAD-26 Surface Soil Analysis Results |
| 2B | SEAD-26 Surface and Subsurface Soil Analysis Results |
| 2C | SEAD-26 Groundwater Analysis Results |
| 3A | SEAD-25 Site-Specific Cleanup Goals for Soil, Sediment and Groundwater |
| 3B | SEAD-26 Site-Specific Cleanup Goals for Soil |
| 4 | Summary of Detailed Evaluation of Alternatives, Proposed Remedial Action Plan for SEAD-25 |
| 5 | Summary of Detailed Evaluation of Alternatives, Proposed Remediation Action Plan for SEAD-26 |

## LIST OF FIGURES


| Figure Number | Description |
|---|---|
| 1 | Location of SEAD-25 and SEAD-26 at Seneca Army Depot Activity |
| 2 | SEAD-25 Areas to be Remediated Showing Groundwater Flow Direction and Elevations |
| 3 | SEAD-25 Areas to be Remediated Showing VOC Plumes in Groundwater |
| 4 | SEAD-26 Area to be Remediated |

## LIST OF APPENDICES


| Appendix | Description |
|---|---|
| A ..... | Cost Backup that Documents Updates to the Draft Final FS |

**Proposed Plan –Final**

# The FIRE TRAINING AND DEMONSTRATION PAD (SEAD-25) and the FIRE TRAINING PIT AND AREA (SEAD-26) at the SENECA ARMY DEPOT ACTIVITY (SEDA) Romulus, New York

August 2002

## *1.0 PURPOSE OF PROPOSED PLAN*

This Proposed Plan describes the alternatives considered for remediation at the Fire Training and Demonstration Pad (SEAD-25) and the Fire Training Pit and Area (SEAD-26) located within the Seneca Army Depot Activity (SEDA). The plan identifies the preferred remedial option with the rationale for its preference. The Proposed Plan was developed by representatives of the U. S. Army Corps of Engineers (USACOE) in cooperation with the U.S. Environmental Protection Agency (USEPA) and the New York State Department of Environmental Conservation (NYSDEC). The U.S. Army is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, and Section 300.430(f) of the National Contingency Plan (NCP). The options summarized here are described in the remedial investigation and feasibility study (RI/FS) report, which should be consulted for a more detailed description of all the options. The RI/FS is contained in the Administrative Record at the Information Repository, which is available for public review at the Seneca Army Depot Activity, Building 123. Please contact the office of Mr. Steve Absolom at the address below in order to view these documents.

This Proposed Plan is being provided to inform the public of the U.S. Army's preferred remedial alternative. This document is intended to solicit public comments pertaining to all the remedial options evaluated, as well as to specify the Army's preferred remedial option.

The remedy described in this Proposed Plan is the preferred remedy for the site. Changes to the preferred remedy or from the preferred remedy to another remedy may be made if public comments or additional data indicate that such a change will result in a more appropriate remedial action. Public comments are solicited on all of the options considered in the detailed analysis of the RI/FS because USEPA, NYSDEC, and the U.S. Army may select a remedy other than the preferred remedy. The final decision regarding the selected remedy will be made after the U.S. Army has taken into consideration all public comments.

A brief description of the U.S. Army's preferred remedy for SEAD-25 is as follows:

- Excavation and off-site disposal of chemically impacted soil;
- Excavation and off-site disposal of sediment in the ditch northwest of the Pad;
- Long-term groundwater monitoring and groundwater use restriction until clean up goals are achieved.

A brief description of the U.S. Army's preferred remedy for SEAD-26 is as follows:

- Long-term groundwater monitoring and groundwater use restriction until clean up goals are achieved; and
- Restriction of the site for use as a daycare facility.

## *2.0 COMMUNITY ROLE IN SELECTION PROCESS*

The U.S. Army relies on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. To this end, the RI/FS report, the Proposed Plan and supporting documentation have been made available to the public for a public comment period, which begins on October 16, 2002 and concludes on November 15, 2002.

A public meeting will be held during the public comment period at the Seneca County Office Building on October 22, 2002 at 7:00 PM to present the conclusions of the RI/FS, to elaborate further on the reasons for recommending the preferred remedial

Dates to remember:
**MARK YOUR CALENDAR**

**October 16, 2002 – November 15, 2002**
Public comment period on RI/FS report, Proposed Plan, and remedies considered

**Tuesday, October 22, 2002**
Public meeting at the Seneca County Office Bldg. from 7:00 to 8:30 PM

option, and to receive public comments. Comments received at the public meeting, as well as written comments, will be documented in the Responsiveness Summary Section of the Record of Decision (ROD)--the document that formalizes the selection of the remedy.

All written comments should be addressed to:

Mr. Stephen Absolom
BRAC Environmental Coordinator
Building 123, P.O. Box 9
Seneca Army Depot Activity
Romulus, NY 14541-5001

Copies of the RI/FS report, Proposed Plan, and supporting documentation are available at the following repositories:

Seneca Army Depot Activity
Building 123
Romulus, NY 14541
(607) 869-1309
Hours are Mon-Fri 8:30 am to 4:30 pm

## *3.0 SITE BACKGROUND*

SEDA is a 10,587-acre military facility located in Seneca County, Romulus, New York, which has been owned by the United States Government and operated by the Department of the Army since 1941. The facility is located in an uplands area, which forms a divide separating two of the New York Finger Lakes, Cayuga Lake on the east and Seneca Lake on the west. The elevation of the facility is approximately 600 feet Mean Sea Level (MSL).

The Fire Training and Demonstration Pad (SEAD-25) is located in the east-central portion of SEDA. The site is bounded to the east by Administration Avenue beyond which is undeveloped land covered by deciduous trees, to the south by Ordnance Drive beyond which is an open grassy field and a stand of coniferous trees, to the west by grassland, brush and conifers and to the north by grassland and a baseball field. A site map of the area is included as **Figure 1.**

The Fire Training Pit and Area (SEAD-26) is located in the southeastern portion of SEDA. The site is bounded to the east and west by SEDA railroad tracks, on the south by grassland and low brush, and on the north by 7th Street. Vehicular access is provided to the site via a locking gate on 7th Street.

SEDA was proposed for the National Priorities List (NPL) in July 1989. In August 1990, SEDA was finalized and listed in Group 14 on the Federal Section of the National Priorities List (NPL). The USEPA, NYSDEC, and the Army entered into an agreement, called the Federal Facility Agreement (FFA), also known as the Interagency Agreement (IAG). This agreement determined that future investigations were to be based on CERCLA guidelines and RCRA was considered to be an Applicable or Relevant and Appropriate Requirement (ARAR) pursuant to Section 121 of CERCLA. In October 1995, SEDA was designated as a facility to be closed under the provisions of the Base Realignment and Closure (BRAC) process. In 2000, the facility was closed.

## *4.0 REMEDIAL INVESTIGATION SUMMARY*

SEAD-25 and 26 are described in three reports previous to the Remedial Investigation (RI). The first report is the Work Plan for CERCLA Expanded Site Inspection (ESI) of Ten Solid Waste Management Units (SWMUs) written by Parsons Main, Inc. in January 1993. This report detailed the site work and sampling to be performed under the ESI. The second report is a SWMU Classification Report (Parsons ES, 1994), which was undertaken to describe and evaluate the Solid Waste Management Units at SEDA. The third is an Expanded Site Inspection Report (Parsons ES, 1995), which describes a more detailed investigation of SEAD-25 and SEAD-26. The fieldwork for the ESI was conducted according to the Work Plan for CERCLA ESI of Ten Solid Waste Management Units (Parsons ES, 1994). The ESI consisted of geophysics, soil sampling, monitoring well installation and groundwater sampling. Seismic profiles performed on the flanks of the site were successful in determining that the bedrock surface slopes to the southwest, generally following the slope of the ground surface, and that groundwater flow is also likely to be in this direction.

Based on the results of the ESI, a RI Workplan was prepared and the RI field program was conducted. At SEAD-25, the RI field program consisted of soil gas and groundwater headspace surveys, soil sampling (surface and in boreholes), groundwater investigation in both overburden and bedrock, surface water/sediment and spring investigations, and an ecological investigation. The RI at SEAD-26 was similar to that at SEAD-25, with the exception of the soil gas and headspace surveys, and the investigation of groundwater in bedrock, which were not part of the field program at SEAD-26. The remedial investigations were designed to meet site-specific data quality objectives (DQOs).

### 4.1 SEAD-25

The primary constituents of concern at the Fire Training and Demonstration Pad (SEAD-25) are volatile organic compounds (VOCs), specifically benzene, toluene, ethylbenzene, and xylenes (BTEX) compounds in both soil and groundwater, as well as lesser amounts of chlorinated ethene compounds in groundwater.

In soils, these impacts were limited to the south-central and western portions of the pad, and several of these compounds were present in concentrations that exceeded their respective NYSDEC Technical and Administrative Guidance Memorandum (TAGM) guidelines. The VOC constituents are believed to have been released to the environment during fire training activities at the Pad. In addition, varying concentrations of semivolatile organic compounds (SVOCs) were also detected in the soil and sediment, mainly in the drainage ditches on the periphery of the site. Less significant impacts from other constituents were also detected at the site.

#### 4.1.1 Soil

The primary impact to soils at the Fire Training and Demonstration Pad was from VOCs (mainly BTEX compounds), however there were other impacts from metals and SVOCs. **Table 1A** and **1B** present the soil sampling results at SEAD-25. The impact from BTEX compounds occurred in the western half of the Pad and the vertical impacts extended from the land surface to a depth of 4 to 6 feet below the surface, which approximately corresponds to the top of competent shale bedrock. The chemicals that exceeded their respective NYSDEC TAGM cleanup guidelines were benzene, toluene, ethylbenzene, xylenes, benzo(a)anthracene, chrysene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene. Note that benzo(a)anthracene was found slightly above the TAGM (224 µg/kg) in only one sample during the ESI, and had an estimated concentration of 230 µg/kg. However, this value was inadvertently omitted from Table 2-1C in the FS.

#### 4.1.2 Surface Water

In surface water, the inorganic compounds (or metals) aluminum, iron, copper, silver, zinc, and lead were found at concentrations above the NYS Class C Ambient Water Quality Standard (AWQS), however, none of these are considered to be ARAR-based constituents of concern for reasons discussed below. Aluminum and iron are present in concentrations that are consistent with background. Copper slightly exceeded the Class C standard in two samples, and zinc and silver were each detected once above the Class C Standard. Lastly, while lead exceeded the AWQS of 1.8 µg/L in four samples (the maximum detection was 7 µg/L), these elevated concentrations are believed to be attributed to high turbidity in the samples. In addition, the presence of surface water in the ditches is intermittent and the ditches are not classified surface water bodies. Therefore, the NYSDEC Class C Standard is not strictly applicable to the surface water in the ditches.

#### 4.1.3 Sediment

Impacts to sediment in the drainage ditches were mainly from SVOCs, pesticides, and heavy metals. The most significant impacts from SVOCs and metals were in the drainage ditch northwest of the Pad, whereas in the other ditch the most significant impact from SVOCs was found in an upgradient location. In the northwest drainage ditch, elevated levels of SVOCs were detected in all four sampling locations along this ditch, between the railroad tracks to the south and the storm drain to the north (approximately 780 feet long). The following SVOC and metal constituents were found to exceed the NYS sediment criteria: benzo(a)anthracene, benzo(a)pyrene, benzo(b)-fluoranthene, benzo(k)fluoranthene, chrysene, ideno(1,2,3-cd)pyrene, phenanthrene, antimony, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, and zinc. Pesticides that exceeded the criteria are 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, aldrin, heptachlor, and heptachlorepoxide.

#### 4.1.4 Groundwater

The primary impact to the groundwater is from two overlapping VOC plumes that both originate at the southwestern portion of the Fire Training and Demonstration Pad, neither of which are expected to extend beyond Ordnance Drive. BTEX was not detected in the bedrock wells at SEAD-25. The primary plume is composed of hydrocarbon compounds that are typically associated with gasoline (BTEX) and it is about 200 feet long. The plume is shown in **Figure 2**. The other plume contains lower concentrations of chlorinated ethenes and it is about 130 feet long. A summary of the groundwater sampling results are shown in **Table 1C**. The following compounds in these plumes exceeded NYSDEC AWQS for Class GA water: benzene, toluene, ethylbenzene, xylene, trichloroethene, 1,2-dichloro- ethene (total), 1,1,1-Trichloroethane, and 1,1-dichloroethane. Other compounds detected in groundwater above the AWQS were chloroform, 2,4-dimethylphenol, 2-methylphenol, 3,3'-dichlorobenzidine, 4-methylphenol, naphthalene, phenol, and thallium.

### 4.2 SEAD-26

At the Fire Training Pit and Area, (SEAD-26) the primary constituents detected are semivolatiles and metals in the soil and sediments. In addition, low levels of volatiles have been detected in the groundwater above NYSDEC GA Standards. However, the constituents that exceed NYSDEC GA Standards in the groundwater are no longer found in the soil of SEAD-26.

#### 4.2.1 Soil

The soil analysis results for SEAD-26 are presented in **Table 2A** and **2B**. The primary impacts to soil at SEAD-26 were from SVOCs. These included PAHs (benzo(a)pyrene, benzo(a)anthracene,benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and dibenz(a,h)anthracene) and significant impacts from other compounds (2,4-dinitrophenol, 2-nitrophenol, 2-nitroaniline, and nitrobenzene), all of which were above the NYSDEC TAGM guideline. Heavy metals that exceeded NYSDEC TAGM guideline values were arsenic, lead, thallium, and zinc.

#### 4.2.2 Surface Water

Impacts to surface water were mainly from heavy metals. Most of the exceedences of the NYS Class C AWQS were for aluminum, iron, and zinc, which are base metal components of the surrounding bedrock (background). Other metals that exceeded the standard (by 1 to 2 times) were lead, nickel, and cyanide and these exceedences occurred at only two locations. (Please note that the text of the RI mistakenly notes that arsenic and chromium, instead of nickel and cyanide, exceed the standard). The compound heptachlor (0.03 µg/L) was also found to exceed the AWQS (0.001 µg/L) at one location.

#### 4.2.3 Sediment

In sediment, impacts were mainly from semivolatiles (i.e., PAHs), pesticides, and heavy metals. The organic compounds that exceeded the NYS sediment criteria were benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, ideno[1,2,3-cd]pyrene, acenaphthene, phenol, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, endosulfan I and II, and heptachlor epoxide, and Aroclor-1260. (Please note that in Table 2-2e of the FS, Aroclor-1260 (maximum of 650 µg/Kg) should have been included in the column showing the number of hits above the criteria.) The metals that exceeded the sediment criteria were arsenic, nickel, copper, mercury, manganese, zinc, lead, and iron.

#### 4.2.4 Groundwater

Results from groundwater analysis are presented in **Table 2C**. Groundwater impacts were primarily from volatile organic compounds, however, concentrations that exceeded the NYSDEC AWQS for Class GA waters were found in only one well that was located on the southern side of the burning pit. The concentrations of benzene, ethylbenzene, xylene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, isopropylbenzene, n-propylbenzene, and p-isopropyltoluene in groundwater exceeded NYSDEC AWQS for Class GA waters. (Please note that the RI did not identify the standards for the later five volatile compounds noted above and, therefore, no exceedences were noted for them in the RI; standards for these compounds were later included in the FS (Table 2-2a)). In addition, naphthalene was detected at a concentration of 15 µg/L in the well on the southern side of the burning pit, which is above the NYSDEC guidance value of 10 µg/L. Based on the groundwater data, no significant plume of volatiles and semi-volatiles exists on the site.

## *5.0 SUMMARY OF SITE RISK*

Based on the results of the RI, a baseline risk assessment was conducted to estimate the risks associated with current and future site conditions. The baseline risk assessment estimated the human health and ecological risk that could result from the site if no remedial action were taken.

### 5.1 Human Health Risk Assessment

The reasonable maximum human exposure was evaluated. A four-step process was used for assessing site-related human health risks for a reasonable maximum exposure scenario:

- *Hazard Identification*--identified the contaminants of concern based on several factors such as toxicity, frequency of occurrence, and concentration.
- *Exposure Assessment* estimated the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways by which humans are potentially exposed.
- *Toxicity Assessment*-- determined the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response).
- *Risk Characterization*--summarized and combined the outputs of the exposure and toxicity assessments to provide a quantitative assessment of site-related risks (for example, one-in-a-million excess cancer risk).

The primary constituents of concern at the Fire Training and Demonstration Pad (SEAD-25) are VOCs (primarily aromatic and some chlorinated compounds), semivolatile organics (mainly PAHs), and to a lesser degree heavy metals, such as arsenic and thallium. At the Fire Training Pit and Area (SEAD-26) the constituents of concern are mainly SVOCs. Impacts are from VOCs, heavy metals, pesticides and polychlorinated biphenyls (PCBs) were also found. Several compounds including xylene and toluene and some PAH compounds are known to cause cancer in laboratory animals and are suspected to be human carcinogens.

The baseline risk assessment evaluated the health effects that may result from exposure for the following three receptor groups:

1. Current site worker,
2. Future on-site construction workers, and
3. Future on-site residents.

The following exposure pathways were considered:

1. Inhalation of volatile organic compounds in ambient air (current site worker, future residential, future on-site construction worker);
2. Inhalation of dust in ambient air (current site worker, future residential, future on-site construction worker);
3. Ingestion of on-site soils (current site worker, future residential, future on-site construction worker);
4. Dermal contact to on-site soils (current site worker, future residential, future on-site construction worker);
5. Ingestion of groundwater (daily) (future residential);

6. Dermal contact to groundwater while showering (future residential);
7. Inhalation of groundwater while showering (future residential);
8. Dermal contact to surface water while wading (future residential);
9. Dermal contact to sediment (future residential);
10. Ingestion of on-site sediment (future residential);

Under current USEPA guidelines, the likelihood of carcinogenic and non-carcinogenic effects due to exposure to site-related chemicals are considered separately. Non-carcinogenic risks were assessed by calculation of a Hazard Index (HI), which is an expression of the chronic daily intake of a chemical divided by its safe or Reference Dose (RfD). An HI that exceeds 1.0 indicates the potential for non-carcinogenic effects to occur. Carcinogenic risks were evaluated using a cancer Slope Factor (SF), which is a measure of the cancer-causing potential of a chemical. Slope Factors are multiplied by daily intake estimates to generate an upper-bound estimate of excess lifetime cancer risk. For known or suspected carcinogens, USEPA has established an acceptable cancer risk range of $10^{-4}$ to $10^{-6}$ (one-in-ten thousand to one-in-one million).

Since the completion of the RI, certain risk calculations were re-calculated because exposure point concentrations (EPCs) used in the BRA (contained in the RI/FS) were not representative of the actual site conditions. Specifically, in the BRA, the 95$^{th}$ Upper Confidence Limit (UCL) of the mean was selected as the EPC, however, in some cases this value was greater than the maximum hit from the actual field data. Unusually high sample quantitation limits (SQL)s can cause the 95$^{th}$ UCL of the mean to exceed the maximum hit. Therefore, where the 95$^{th}$ UCL of the mean exceeded the maximum detected value, the maximum value was used as the EPC in the revised calculations. A review of the data indicates that by making this revision, the major conclusions of the Remedial Investigation do not change. In addition, media of interest remain the same; media that exhibited unacceptable risk still exhibit unacceptable risk. However, ecological quotients, HI values, and carcinogenic risks calculated for certain constituents of concern decrease significantly when the maximum value is used for the EPCs, instead of the 95$^{th}$ UCLs with unusually high SQLs.

### 5.1.1 SEAD-25

The results of the baseline risk assessment at SEAD-25 indicate that for the future on-site construction worker the HI was above the USEPA target of 1.0, while the cancer risk for this receptor was within the target risk range of $10^{-6}$ to $10^{-4}$. For the future on-site residents both measures of risk (cancer risk and HI) are above the USEPA target risk range/value noted above.

The current site worker did not exhibit excess risk of cancer above the USEPA target range ($3 \times 10^{-8}$ , revised from $2 \times 10^{-7}$ in RI/FS) or a potential for adverse non-carcinogenic health threats.

The risk analysis of the future on-site construction worker receptor scenario indicated that the cancer risk is $4 \times 10^{-6}$ and the HI is 4. The cancer risk is within the USEPA target risk ranges of $10^{-6}$ to $10^{-4}$, but the hazard index is above the USEPA target risk value of 1. These risks are mainly due to inhalation of VOCs in the ambient air. Inhalation of ambient air is responsible for 75% of the cancer risk and 98% of the hazard index.

The risk analysis for future on-site residents showed that the excess cancer risk under this exposure scenario is $3 \times 10^{-4}$ (revised from $1 \times 10^{-3}$ in RI/FS) with a HI of 10 and 5 for child and adult, respectively. Both measures of risk are above the USEPA target risk ranges of $10^{-6}$ to $10^{-4}$ and 1.0, respectively. These risks are due primarily to potential exposure of receptors to on-site groundwater as their sole drinking water source; groundwater ingestion is responsible for over 67% of the total cancer risk and over 80% of the HI. A smaller contributor to the cancer risk is ingestion of sediment.

### 5.1.2 SEAD-26

The results of the baseline risk assessment at SEAD-26 indicate that the cancer risks for all the receptors evaluated were within the USEPA target risk range. With respect to noncarcinogenic risk, the child receptor under the future residential scenario had a HI that slightly exceeded the target value of 1 due to ingestion of groundwater and ingestion of site soils. The current site worker did not exhibit excess risk of cancer above the USEPA target range or a potential for adverse non-carcinogenic health threats.

The future on-site construction worker had a cancer risk and hazard index of $2 \times 10^{-6}$ and 0.4 (HI revised from 0.6 in RI/FS), 0.6, respectively. The cancer risk is within the USEPA target risk ranges of $10^{-6}$ to $10^{-4}$, and the hazard index is not above the USEPA target risk value of 1.

The risk analysis for future on-site residents showed that the cancer risk under this scenario is $7 \times 10^{-5}$, and the HI for a child slightly exceeds 1 and the HI for an adult is 0.4. The cancer risk is within the USEPA target risk ranges of $10^{-6}$ to $10^{-4}$, and the hazard index is not above the USEPA target risk value of 1 for the adult receptor, however, the child receptor slightly exceeded 1. The risk driver for this scenario is ingestion of on-site soils: 86% of the total cancer risk and 70% of the child hazard index is due to ingestion of on-site soils. There were also lower, but equal, contributions from ingestion of groundwater and sediment.

### 5.1.3 Additional Information on SEAD-25 and SEAD-26 Human Health Risk Assessment

The results of the baseline risk assessment indicate that potential future on-site residents and future on-site construction workers are the receptors at SEAD-25 that exhibit excess risk of cancer above the USEPA target range and a potential for non-carcinogenic effects. However, the likelihood of any future residential development and future groundwater use on-site is low. If there is no development on the site then the pathway cannot be completed and there is no associated risk. At SEAD-26, none of the USEPA risk criteria were exceeded, other than a slight excess risk for potential non-carcinogenic effects to a future resident child.

Currently, exposure of off-site populations to chemicals in groundwater at SEAD-25 is unlikely, due to the relatively small magnitude of the impacts and direction of groundwater flow and the long distance from the plume to the nearest downgradient boundary (more than 2 miles). At SEAD-26, the current off-site populations are upgradient from the impacted site; therefore, impacts to their wells by the release at SEAD-26 are not likely.

The remedial action selected will be based upon the RI/FS that includes a detailed analysis of remedial alternatives. In addition, the preferred alternative will be protective of receptors that are appropriate for the intended future land use, which is light industrial use for SEAD-25 and office/planned industrial development for SEAD-26. For SEAD-25, residential land use was only considered to compare the cost of remediating the site for this land use versus the cost to implement restricted use on the site, and because the area directly east of SEAD-25 is designated as residential. Another reason for the consideration of a residential use is to comply with Army guidance, which states that alternatives consistent with property use without restriction should be considered to compare life-cycle institutional control costs with more conservative clean-up alternatives (DAIM-BO, "Army Guidance for Using Institutional Controls in the CERCLA Process").

## 5.2 Ecological Risk Assessment

The reasonable maximum environmental exposure was also evaluated. A four-step process was used for assessing site-related ecological risks for a reasonable maximum exposure scenario:

- *Characterization of the Unit and the Ecological Communities it May Affect*—Includes ecological conditions observed at the unit, site habitat characterization, wildlife resources that are present in the area, and ecological resource values to wildlife and to humans.
- *Exposure Assessment*—Discusses chemicals of potential concern (COPC), exposure point concentrations, and it presents exposure assessments. Chemical distribution of COPCs, and their uptake through various pathways are also discussed in this section. And daily intakes of COPCs through environmental media are quantified as well.
- *Toxicity Assessment*—Assesses ecological effects that potentially may result from receptor exposure to COPCs. Evaluates potential toxicity of each COPC in each medium and defines toxicity benchmark values that will be used to calculate the ecological quotient (EQ.)
- *Risk Characterization*—Integrates the results of the preceding elements of the assessment. It estimates risk with respect to the assessment endpoints, based on the predicted exposure to and toxicity of each COPC.

Ecological risk was then presented in terms of an EQ, which is derived from the results of the exposure quantification and the toxicity assessment for each COPC. The EQs are based on relevant measurement endpoints and are indicative of the potential for each chemical to pose an ecological risk to receptors. In general, guidelines suggest that EQs less than or equal to 1 present no probable risk. EQs between 1 and 10 present a small potential for environmental effects, EQs between 10 and 100 present a significant potential that effects could result from greater exposure, and EQs greater than 100 indicate the highest potential for expected effects.

The results of the ecological risk assessment presented in the RI report (Parsons ES, May 1998) concluded that there is negligible risk to the ecosystems of the SEAD-25 and SEAD-26 study areas. During the field evaluation, no overt acute toxic impacts were noted. The quantitative ecological risk evaluation initially suggested that a slight possibility exists for the COPCs to present a small potential for environmental effects due to sediment at SEAD-25 and due to sediment, soil, and surface water at SEAD-26. Note that EPCs were recalculated since the completion of the RI/FS because, as noted previously in the discussion of human health risk, some 95$^{th}$ UCLs were calculated to be above the maximum concentration detected on the site. Thus, some of the EQ cited in the discussion below have been revised.

At SEAD-25, aquatic-amphibian (current scenario) receptors were most affected by the chemicals. In sediment, the EQs that were between 10 and 100 were mostly driven by 4,4'-DDD (EQ=16, revised from 1,300), heptachlor (EQ=33), lead (EQ=12), and silver (EQ=10). Terrestrial (current conditions) receptors are also likely to be most affected by iron (EQ=39) in the sediment at SEAD-25. Note that the highest concentrations of 4,4'-DDD, fluoranthene, heptachlor, lead, silver, and iron were all found in the drainage ditch northwest of the site.

At SEAD-26, terrestrial receptors are mostly affected by COPCs in the soil. For current conditions, the risk drivers are

bis(2-ethylhexyl)phthalate (EQ=86.3) and zinc (EQ=24.3). For future conditions, the risk drivers are di-n-butylphthalate (EQ=5.7) and zinc (EQ=21.6). The highest EQs for aquatic-amphibian populations under current conditions were from the chemicals heptachlor (EQ=23.0, revised from 28.0), aluminum (EQ=21.4), iron (EQ=28.1), and zinc (EQ=2.7, revised from 15.4) in surface water, and benzo(b)fluoranthene (EQ=20), chrysene (EQ=20, revised from 32), and phenol (EQ=22) in the sediment.

Although there are EQs greater than 1, EQs alone are not an indication of risk. Furthermore, upon consideration of the weight of evidence presented in the Ecological Risk Summary Section of the RI, the COPCs identified at SEAD-25 and SEAD-26 are considered to pose negligible risk to the ecosystem at these sites. In particular, sediment is not believed to be a significant media of interest at the sites. The primary reason is that, while a significant portion of the risk was attributed to aquatic receptors, the ecological quotient is based on continuous exposure to the chemicals in the sediment in the ditches. However, the drainage ditches on the sites only contain water for a period of time after heavy rains or from snow melt. Thus, aquatic organisms are unlikely to be present in the drainage ditches when the conditions in the ditches are not aquatic. In addition at SEAD-25, the presence of PAHs in sediment may be due to sources other than past activities at the site, as evidenced by the increasing concentrations measured in "upstream" areas of the site.

## *6.0 SCOPE AND ROLE OF ACTION*

The scope of this action is to provide adequate protection for current and future human and ecological receptors at the Fire Training and Demonstration Pad, and the Fire Training Pit and Area at SEDA. These two sites are two of 25 areas subject to remedial investigations at SEDA. The other areas will be addressed separately.

At SEAD-25, the action considered will address remediation of the soil and groundwater. Unacceptable human health risks to future industrial users of the site as well as exceedences of NYSDEC GA Standards in groundwater are the primary reasons for addressing these two media. Action is also considered for this site that is protective future residential users. Such action would also incorporate remediation of certain sediments at SEAD-25 to meet human health risk criteria for future residential receptors.

At SEAD-26, the action considered will address remediation of the groundwater. Since the constituents that exceed NYSDEC GA Standards are no longer found in the soil of SEAD-26, there is no need for a remedial action addressing soil contamination for the purposes of protecting groundwater. A land use restriction on use of the land as a day care facility will be implemented to prevent ingestion of site soils. By addressing the groundwater and restricting use of the site, human health risks for current users and future residential users will be within acceptable ranges.

## *7.0 REMEDIAL ACTION OBJECTIVES*

Remedial action objectives have been developed that consist of media-specific objectives for the protection of human health and the environment. These objectives are based on available information and standards such as ARARs and risk-based levels established in the risk assessment. The cleanup goals for soil, sediment, and groundwater at SEAD-25 and for groundwater at SEAD-26 are presented in **Table 3A** and **Table 3B**, respectively. The following sections describe how these remedial objectives were determined.

Remedial action objectives are specific goals to protect human health and the environment; they specify the contaminant(s) of concern, the exposure route(s), receptor(s), and acceptable contaminant level(s) for each exposure route. These objectives are based on risk levels established in the risk assessment and comply with ARARs to the greatest extent possible. The remedial action objectives for the SEAD-25 and SEAD-26 operable unit are as follows:

- Prevent public or other persons from direct contact with adversely impacted soils, sediments, solid waste and surface water that may present a health risk.
- Eliminate or minimize the migration of hazardous constituents from soil to groundwater.
- Prevent ingestion of groundwater containing constituents in excess of federal and state drinking water standards or criteria, or which pose a threat to public health.
- Prevent off-site migration of constituents above levels protective of public health and the environment.
- Restore groundwater, soil, surface water, and sediments to levels that are protective of public health and the environment.

## *8.0 SUMMARY OF REMEDIAL ALTERNATIVES*

CERCLA requires that each selected site remedy be protective of human health and the environment, be cost effective, comply with other statutory laws; and use permanent solutions, alternative treatment technologies, and resource recovery options to the maximum extent possible. In addition, the statute includes a preference for the treatment as a principal element for the reduction of toxicity, mobility, or volume of the hazardous substances.

## 8.1 SEAD-25 AND SEAD-26 REMEDIAL ALTERNATIVES

Ten remedial alternatives were identified for SEAD-25. These alternatives are:

- RA25-1: The No-Action Alternative,
- RA25-2: Institutional Controls, Natural Attenuation of Plume,
- RA25-3: Bioventing of Soil, Air Sparging of Plume,
- RA25-3A: Bioventing of Soil, Natural Attenuation of Plume,
- RA25-4: Source Removal, Off-site Disposal, and Long-Term Monitoring of Plume,
- RA25-5: Soil Removal, Off-site Disposal, and Air Stripping of Plume,
- RA25-6: Soil Removal, Off-site Disposal, and Air Sparging of Plume,
- RA25-3R: Bioventing/Air Sparging/Sediment Removal - Residential Alternative,
- RA25-3AR: Bioventing/Natural Attenuation/Sediment Removal - Residential Alternative, and
- RA25-4R: Source Removal, Off-site Disposal, Sediment Removal, and Long-Term Monitoring of Plume – Residential Alternative.

Alternatives RA25-1 through RA25-6 include institutional controls to prevent residential land use.

Alternatives RA25-3R, RA25-3AR, and RA25-4R include temporary institutional controls to prevent the use of groundwater until the NYSDEC GA Standards are met.

Four remedial alternatives were identified for SEAD-26. These alternatives are:

- RA26-1: The No-Action Alternative,
- RA26-2: Institutional Controls (Interim) and Monitoring of Plume,
- RA26-3: Air Sparging of Plume, and
- RA26-4: Air Stripping of Plume.

Alternative RA26-2 includes institutional controls to prevent the use of groundwater until clean up goals are met as well as a land use restriction for a day care facility..

Since the completion of the FS, some of the alternatives have been revised slightly and, therefore, the descriptions and costs of the alternatives may differ slightly from the previous documents. Cost backup that documents the changes is provided in Appendix A. The options for both SEAD-25 and SEAD-26 are described below.

All alternatives for SEAD-25 and SEAD-26 include interim land use controls as part of the remedy. The land use controls are intended to prevent the use of groundwater as drinking water. The goals of the land use controls are to ensure adequate protection of human health and the environment, and to preserve and promote the long-term effective operation of remedial alternatives proposed for the sites. Types of land use controls may include deed restrictions and physical controls such as signs and fences. A public water supply is available, thus a groundwater restriction should have minimal impact on land reuse of the site. For SEAD-25, once groundwater clean up goals are achieved, the groundwater use restriction may be eliminated and the site may be released for unrestricted use. For SEAD-26, groundwater use restrictions may also be eliminated once groundwater clean up goals are achieved. However, a restriction on the use of the property at SEAD-26 as a daycare facility will remain.

### 8.1.1 Alternative RA25-1: No-Action Alternative

The CERCLA program requires that the "No-Action" option be considered as a baseline for comparison of other options. There are no costs associated with the no-action option. The no-action option means that no remedial activities would be undertaken at the site. No monitoring or security measures would be undertaken. Any attenuation of the threats posed by the site to human health and the environment would be the result of natural processes. Current security measures would be eliminated or modified so that the property may be transferred or leased as appropriate.

### 8.1.2 Alternative RA25-2: Institutional Controls, Natural Attenuation of Plume

Capital Cost: $38,100
O & M Cost: $1,526,400 - soil sampling and groundwater quarterly monitoring
Present Worth Cost: $1,564,500
Construction Time: One week for building fence
[This alternative has been revised since the Draft Final FS by re-evaluating the O & M costs. Cost backup for this revision is provided in Appendix A.]

Alternative RA25-2 (Institutional Controls and Natural Attenuation) would rely upon natural mechanisms to biodegrade organic chemicals (BTEX) in the soil and groundwater, also referred to as bioremediation. Site characterization data presented in the RI (dissolved oxygen, nitrate, and Eh) provide evidence that degradation of the plume is occurring, and these data also provide support for the analytical modeling that showed that the plume will degrade over time. Dechlorination would treat the relatively low concentrations of chlorinated ethenes in groundwater. RA25-2 is similar to the no-action alternative in that it would result in leaving areas with

chemically-impacted soils intact. Institutional Controls, which are an element of this alternative, are discussed at the beginning of this section. Continued quarterly groundwater monitoring and soil sampling every 5 years for 150 years would document the natural degradation of the plume and would provide a detection mechanism for off-site migration of chemicals, which would require that additional action be taken.

The cost of this alternative is relatively high since it includes quarterly groundwater monitoring and soil monitoring every five years for a period of 150 years, in addition to building a fence and posting signs.

### 8.1.3 Alternative RA25-3: Bioventing of Soil and Air Sparging of Plume

Capital Cost: $373,500
O & M Cost: $710,000
Present Worth Cost: $1,083,500
Construction Time: construction and start-up of the bioventing/air sparging system should take 2 to 3 months.
[This alternative has been revised since the Draft Final FS by re-evaluating the O & M costs and adding soil monitoring. Cost backup for this revision is provided in Appendix A.]

Alternative RA25-3 involves the installation of a bioventing system and two air sparging trenches. An aboveground bioventing system would feed air through one injection point to the western portion of the Fire Training and Demonstration Pad. The bioventing system consists of one compressed air pump to feed oxygen into the soil to promote the natural degradation of organic chemicals in the source area. Aeration of the VOC source area is expected to cause the volatilization of organic chemicals in the groundwater near the source. However, the low airflow employed in bioventing provides only enough oxygen to sustain microbial activity near the source. Thus, the two air sparging trenches would be used to remediate downgradient portions of the plume north of Ordnance Drive. One would be located just off the southwest corner of the pad, and the other farther downgradient. Each trench would be approximately 200 feet long. The air sparging system consists of two trenches installed in the saturated soil with horizontal piping for air injection. The injected air promotes volatilization of the organic constituents in the groundwater, and aerobic biodegradation. Due to the low concentration of volatiles, a vapor recovery system is not required. Periodic groundwater monitoring would be used to assess the progress of the treatment.

The bioventing system will be run until the NYSDEC soil criteria for groundwater protection from organic contaminants are met, approximately 5 years. Groundwater would be monitored for 10 years, and the air sparging treatment system would be run until the concentrations of organics in the groundwater are below the NYSDEC criteria for Class GA groundwater, about 10 years. Any soils removed for the downgradient trench installation would come from areas in which previous soil sampling has indicated little or no soil contamination. The soil from the upgradient trench would be disposed off-site in a RCRA approved landfill.

Institutional controls, which are discussed at the beginning of this section, are included as an element of this remedy until ARARs are achieved.

### 8.1.4 Alternative RA25-3A: Bioventing of Soil and Natural Attenuation of Plume

Capital Cost: $236,400
O & M Cost: $912,800
Present Worth Cost: $1,149,200
Construction Time: construction and start-up of the bioventing system should take 2 to 3 months.
[This alternative has been revised since the Draft Final FS by re-evaluating O & M costs and adding soil monitoring. The period required for groundwater monitoring was also modified. Cost backup for this revision is provided in Appendix A.]

Alternative RA25-3A involves the installation of a bioventing system to remove volatiles from the source area and natural attenuation (biodegradation) with long-term groundwater monitoring to treat the impacted groundwater. An aboveground bioventing system would feed air through one injection point (vertical well) to the western portion of the fire training and demonstration pad. The bioventing system consists of one compressed air pump to feed oxygen into the soil to enhance the natural degradation of organic chemicals in the source area. Aeration of the VOC source area is expected to enhance the volatilization of organic chemicals in the groundwater near the source. However, the low airflow employed in bioventing provides only enough oxygen to sustain microbial activity near the source. Natural attenuation would be relied upon to enhance the degradation of BTEX and chlorinated ethenes in groundwater; field data indicate that natural degradation is occurring at the site. This alternative would use a groundwater monitoring program to assess the effectiveness of this approach over time.

The bioventing system will be run until the NYSDEC soil criteria for groundwater protection from organic contaminants are met, about 5 years. Groundwater monitoring of natural attenuation would be performed until the concentrations of organics in the groundwater are below the NYSDEC criteria for Class GA groundwater; this is expected to occur in about 15 years, based on modeling results.

Institutional controls, which are discussed at the beginning of this section, are included as an element of this remedy until ARARs are achieved.

### 8.1.5 Alternative RA25-4: Source Removal, Off-site Disposal, and Long-Term Monitoring of Plume

Capital Cost: $659,800
O & M Cost: $456,000
Present Worth Cost: $1,115,800
Construction Time: Excavation of soil will take about 2 months, depending on weather, setting up the staging area and construction of an equipment decontamination pad will take about 1 week. An air stripper for treatment of the groundwater recovered during the excavation would be onsite for the duration of the excavation. The stripper will be operated in batch mode as sufficient water is collected.
[This alternative has been revised since the Draft Final FS. The capital cost decreased as well as the period required for groundwater monitoring. In addition, the costs for this alternative have been revised by replacing monitored natural attenuation with long-term monitoring of the plume. This change caused a slight decrease in the O & M presented in the Draft Final FS due to less intensive monitoring requirements. Cost backup for these revisions is provided in Appendix A.]

This option consists of excavation of the soils that make up the western 3/4 of the fire demonstration pad, as outlined in **Figures 2 and 3**. This remedial action would remove an area approximately 60 feet by 100 feet to a depth of 6 feet (approximately 1,350 cubic yards). In doing this, chemically impacted soils that are the source of the groundwater plume at SEAD-25 would be removed. The limits of excavation were established so that there would not be any residual contamination in soils above TAGM levels. The soils would be removed using standard construction equipment, such as a front-end loader or bulldozer. The excavated soils would be immediately transported to a permitted off-site landfill or treatment facility.

The site is accessible by trucks, and each truck would be loaded directly from the excavation area. A small staging and equipment decontamination area would be set up as necessary, and would likely be located near one of the site roads. To assure that health and safety requirements are met air monitoring would be installed to monitor VOC and particulate emissions during excavation and loading activities. Care would be taken to assure that the trucks are not overloaded. The soils would be covered with a tarp during transport to ensure that no dust is released from the trucks. The threat from dust released during the on-site excavation would be eliminated through the use of dust suppression techniques.

A significant amount of groundwater would be treated during implementation of the source removal under this alternative. The groundwater at the source, which would be recovered during excavation of soil, would be treated using an on-site air stripper. During the excavation, confirmatory sampling, and backfilling process, additional groundwater would be treated as the excavation pit is de-watered. Clean backfill would be used to replace the excavated soil, preventing future leaching of volatiles to the groundwater and dermal contact to human and environmental receptors. Because there could be minor amounts of residual contamination, the groundwater would be closely monitored during quarterly sampling.

Over time—approximately 10 years—the concentration of volatiles remaining in groundwater would be expected to decrease to levels that meet stringent Class GA groundwater standards. Long-term monitoring will confirm that the plume is attenuating.

Institutional controls, which are discussed at the beginning of this section, are included as an element of this remedy until ARARs are achieved.

### 8.1.6 Alternative RA25-5: Source Removal, Off-site Disposal, and Air Stripping of Plume

Capital Cost: $716,700
O & M Cost: $340,800
Present Worth Cost: $1,057,500
Construction Time: Excavation of soil should take 2-3 months depending on weather. Construction and start-up of the air stripping system should take 2 to 4 months.
[This alternative has been revised since the Draft Final FS. Revisions in the Proposed Plan included re-evaluating both capital and O & M costs. Backup for this revision is provided in Appendix A.]

Alternative RA25-5 uses the source removal approach described previously in RA25-4. If the source removal excavation is conducted when the groundwater table is high, the groundwater would be recovered and delivered to the air stripper system, described below, which would be used to treat the downgradient portions of the plume. For the treatment of groundwater, this alternative consists of the installation of two interceptor trenches that would collect groundwater, which would then be pumped to a treatment unit. Each trench would be approximately 200 feet long by 3 feet wide by 8 feet deep. The trench would extend from the ground surface to the competent shale bedrock. The trenches would be excavated with a bucket loader and the outside walls would be lined with a geotextile filter. Perforated PVC pipe would be placed in the bottom of the trench to facilitate drainage to the collection sumps. The trench would then be filled in with gravel to a depth of 2 to 3 feet below grade. Geotextile would be placed over the gravel, and the

trench would be backfilled to grade with the soil previously removed. The water would be pumped from the trenches to the treatment system where metals would be removed from it. Suspended solids in the groundwater would be filtered and removed. Hardness and organics would also be removed from the groundwater. After treatment, groundwater would pass through a liquid phase carbon unit (polish) that would remove any volatiles via carbon adsorption. This water would then be discharged to the drainage ditches adjacent to the patrol roads, and eventually to Kendaia Creek. The treated groundwater would require sampling, and, if appropriate, a State Pollutant Discharge Elimination System (SPDES)-equivalent permit.

Threat from releases during the excavation would be minimized using techniques described in Alternative RA25-4. The excavations of the interceptor trenches would be in areas where the concentrations of hazardous constituents in the groundwater are low. Because of the low chemical concentrations in the groundwater, emissions from the air stripper would meet all NYSDEC and USEPA air standards and would, therefore, be protective of human health.

The groundwater treatment system would operate until the concentrations of volatile organics in the groundwater are below the NYSDEC criteria for Class GA groundwaters; less than 1 year. Any soils removed for the groundwater treatment trenches would be from areas in which previous soil sampling has indicated little or no soil impacts. Such soil can be used as fill. Other soils could be treated on-site or sent off-site to an appropriate treatment, storage, and disposal facility. The only potential treatment residual is spent activated carbon, if carbon is used to polish the liquid stream. This carbon would be sent off-site for regeneration or disposal.

Annual O&M costs for this alternative include quarterly groundwater monitoring. Monitoring is expected to be performed for approximately 5 years. This includes energy, equipment maintenance, and replacement of spent carbon and filter beds for the air stripping system.

Institutional controls, which are discussed at the beginning of this section, are included as an element of this remedy until ARARs are achieved.

### 8.1.7 Alternative RA25-6: Source Removal, Off-site Disposal, and Air Sparging of Plume

Capital Cost: $682,100
O & M Cost: $793,700
Present Worth Cost: $1,475,700
Construction Time: Construction and start up of air sparging system should take 2 to 3 months. Excavations should take 2-3 months depending on weather.
[This alternative has been revised since the Draft Final FS. Revisions in the Proposed Plan included re-evaluation of both capital and O & M costs. Cost backup for this revision is provided in Appendix A.]

Alternative RA25-6 involves the excavation and removal of soil as described in alternative RA25-4 and the installation of air sparging trenches as described in RA25-3. Excavated soils would be disposed of off-site. Groundwater recovered during the excavation would be treated in an air sparging system, similar to that described under alternative RA25-3. The treatment system would be run until the concentrations in the groundwater are below the NYSDEC criteria for Class GA groundwaters.

Air sparging would take 10 years and groundwater monitoring would take 10 years.

Institutional controls, which are discussed at the beginning of this section, are included as an element of this remedy until ARARs are achieved.

### 8.1.8 Alternative RA25-3R: Bioventing/Air Sparging/Sediment Removal - Residential Alternative

Capital Cost: $422,300
O & M Cost: $687,200
Present Worth Cost: $1,109,500
Construction Time: construction and start-up of the bioventing/air sparging system should take 2 to 3 months.
[This alternative has been revised since the Draft Final FS by re-evaluating both capital and O&M costs. The quantity of sediment to be removed under this scenario was revised from that considered in the FS. The excavation of sediment under the residential scenario became limited to only 1 ditch, the northwest ditch, due to a re-evaluation of the risk, which is documented in past correspondence between the Army and the agencies. Cost backup for this revision is provided in Appendix A.]

Alternative RA25-3R addresses a future residential use of SEAD-25 even though the intended future use of SEAD-25 is industrial. As a result, to achieve acceptable human health risk under the residential scenario, sediment must be incorporated into the media of concern, in addition to soil and groundwater, which were both considered under the industrial scenario. To evaluate residential scenarios, the removal of sediment has been incorporated into three high-ranking alternatives under the industrial scenario, RA25-3, RA25-3A, and RA25-4.

Alternative RA25-3R would be implemented exactly as alternative RA25-3 except that sediment from the ditch northwest of the pad at SEAD-25 would be excavated and disposed off-site. Sediment would be excavated from the railroad tracks, north to the storm drain along the northwest drainage ditch (approximately 780 feet). The excavation would be approximately 3 feet wide

and 2 feet deep, resulting in the removal of approximately 175 cubic yards of sediments. This is different from the FS, which proposed that sediment from both ditches be removed. The removal would occur only at the northwestern ditch because it was shown in the RI to have the highest concentrations of chemicals of concern (PAHs, metals, and pesticides) and it presents the most risk, compared to the other ditch that is adjacent to Administrative Avenue and Ordnance Drive. The air sparging systems would run for about 10 years, the bioventing system for about 5 years. Groundwater would be monitored for 10 years.

In the short-term, institutional controls, which are discussed at the beginning of this section, are included as an element of this remedy until ARARs are achieved.

**8.1.9 Alternative RA25-3AR: Bioventing/Natural Attenuation/Sediment Removal - Residential Alternative**

Capital Cost: $285,200
O & M Cost: $882,100
Present Worth Cost: $1,167,300
Construction Time: Construction and start-up of the bioventing system should take 2 to 3 months.
[This alternative has been revised since the Draft Final FS by re-evaluating both capital and O & M costs. The quantity of sediment to be removed under this scenario was revised from that considered in the FS. The excavation of sediment under the residential scenario became limited to only 1 ditch, the northwest ditch, due to an re-evaluation of the risk, which is documented in past correspondence between the Army and the agencies. Cost backup for this revision is provided in Appendix A.]

Alternative RA25-3AR also addresses a future residential use of SEAD-25 and, for reasons discussed in alternative RA25-3R, the removal of sediment has been incorporated into this alternative.

Alternative RA25-3AR would be implemented exactly as alternative RA25-3A except that sediment from the ditch northwest of the pad at SEAD-25 would be excavated and disposed off-site. As described in Alternative RA25-3R, approximately 175 cubic yards of sediment would be removed from this ditch. The removal would occur at the northwestern ditch because it was shown in the RI to have the highest concentrations of chemicals of concern and it presents the most risk, as noted in the previous alternative. Again, this is different from the FS, which states that sediment from both ditches will be removed.

The bioventing system will run for about 5 years, groundwater will be monitored for 15 years.

In the short-term, institutional controls, which are discussed at the beginning of this section, are included as an element of this remedy until ARARs are achieved.

**8.1.10 Alternative RA25-4R: Source Removal/Off-site Disposal/ Long-Term Monitoring of Plume/Sediment Removal – Residential Alternative**

Capital Cost: $701,000
O & M Cost: $432,800
Present Worth Cost: $1,133,800
Construction Time: Excavation of soil will take about 2 months, depending on weather, setting up the staging area and construction of an equipment decontamination pad will take about 1 week. Air stripper for groundwater recovered during the excavation would have to be operated for less than 1 week; setting up air stripper would take 1-2 months.
[This alternative was not evaluated in the FS. It is very similar to RA25-4 however, with the additional sediment removal from one ditch similar to the residential alternatives for RA25-3R and RA25-3AR. The costs have been determined from reviewing the updated costs of these alternatives. Cost backup for this revision is provided in Appendix A.]

Alternative RA25-4R addresses a future residential use of SEAD-25 even through the intended future use of SEAD-25 is industrial. This alternative was not addressed in the FS, but is included in the Proposed Plan to consider an alternative similar to RA25-4 that meets acceptable human health risk goals for a residential scenario. Alternative RA25-4 can be implemented in the least amount of time without a long-term operating system on-site. In the evaluation of alternatives, time to implement and elimination of operating systems have gained increased importance since the FS was issued due to the fact that the transfer of property at Seneca has become a higher priority. As a result, a residential scenario was evaluated for RA25-4 and it was found that in order to achieve acceptable human health risk under the residential scenario, sediment must be incorporated into the media of concern, in addition to soil and groundwater, which were both considered under the industrial scenario.

Alternative RA25-4R is identical to RA25-4 except that sediment from the ditch northwest of the pad at SEAD-25 (approximately 175 cubic yards) would be excavated and disposed of along with the soils, as described in Alternative RA25-3R. The removal would occur at the northwestern ditch because it was shown in the RI to have the highest concentrations of chemicals of concern and it presents the most risk, as noted in the previous two alternatives.

The excavation of the soils and sediments would take only a few months and long-term monitoring to confirm that natural biodegradation is occurring would continue for 10 years.

In the short-term, institutional controls, which are discussed at the beginning of this section, are included as an element of this remedy until ARARs are achieved.

### 8.1.11 Alternative RA26-1: No-Action Alternative

The No-action alternative means that no remedial activities will be undertaken at the site. No monitoring or security measures will be undertaken other than those currently implemented at the site. Any attenuation of the threats posed by the site to human health and the environment would be the result of natural processes.

### 8.1.12 Alternative RA26-2: Institutional Controls and Monitoring of Plume

Capital Cost: $72,300
O & M Cost: $316,700
Present Worth Cost: $389,100
Construction Time: No construction.
[The above costs were revised since completion of FS. Since the FS, the monitoring time has been updated to 20 years, to reflect the results of the groundwater model using more realistic assumptions. Cost backup for this revision is provided in Appendix A.]

The institutional control and monitoring of plume alternative involves monitoring of the groundwater concentrations in well MW26-7 and several other wells. The concentrations of volatile constituents in these wells could be expected to decline over time, through dispersal of the hazardous constituents in the groundwater and natural biodegradation. Additionally, the volume of impacted groundwater would be expected to decrease over time. This option includes groundwater monitoring similar to the program currently implemented at the site. Current monitoring activities include quarterly monitoring of a number of wells in place at the site and security measures, which effectively eliminate public access to the area.

Groundwater monitoring is included as an element of this remedy until ARARs are achieved. Restriction of this property as a daycare facility will remain.

### 8.1.13 Alternative RA26-3: Air Sparging of Plume

Capital Cost: $299,800
O & M Cost: $395,200
Present Worth Cost: $695,000
Construction Time: Construction and start-up of the air sparging system should take 1 to 2 months.
[Above costs were revised slightly since completion of FS. Cost backup is provided in Appendix A.]

Alternative RA26-3 involves injecting air into the well that exceeded ARARs for VOCs (well MW26-7). Vertical piping into the existing well would be used to deliver air to the groundwater. The air promotes volatilization of the organic constituents in the groundwater, and also promotes aerobic biodegradation. Due to the low concentration of organics in the groundwater there would not be a need for vapor recovery wells, or off gas treatment. Periodic groundwater monitoring would be used to assess the progress of the treatment.

The remediation would be designed and implemented such that any air emissions generated by the air sparging system would be below all USEPA and NYSDEC air quality standards.

The treatment system would be run until the concentrations of BTEX in the groundwater are below the NYSDEC criteria for Class GA groundwater.

The basis of this technology is the volatility of BTEX dissolved in the groundwater. Air would be bubbled into the bottom of well MW26-7, which would cause the dissolved volatile solvents to undergo a phase transfer from the liquid phase to the gaseous phase. Given the low concentrations of BTEX, a vacuum collection system would not be required. Air sparging systems are easy to implement, especially one as fundamental as what is required at SEAD-26. Hydraulically, there would be the potential to cause the groundwater to mound in the area surrounding the well due to the increase in pressure from the sparging system. This may cause the groundwater plume to spread around the well. The administrative feasibility of this alternative is good. There would be few air emissions from the sparging system due to the low VOC concentrations present.

Cost for this alternative includes operation of air sparging system and groundwater monitoring for 10 years.

Groundwater monitoring is included as an element of this remedy until ARARs are achieved. Restriction of this property as a daycare facility will remain.

### 8.1.14 Alternative RA26-4: Air Stripping of Plume

Capital Cost: $340,000
O & M Cost: $443,400
Present Worth Cost: $783,600
Construction Time: 1 to 2 months
[The above costs were revised slightly since completion of FS. Cost backup is provided in Appendix A.]

Alternative RA26-4 consists of the installation of a pump that would be used to extract the groundwater around the BTEX-impacted well (MW26-7) and deliver it to a treatment unit with a 5,000-gallon tank. Suspended solids in the groundwater would be filtered and removed. Metals, hardness and organics would also be removed from the groundwater. After treatment, groundwater would pass through a liquid phase carbon unit

(polish) and would discharge to the drainage ditches adjacent to the patrol roads, and eventually to Kendaia Creek. The treated groundwater would require sampling, and, if appropriate, a SPDES equivalent permit.

The treatment system would be run until the concentrations of BTEX in the groundwater are below the NYSDEC criteria for Class GA groundwaters. There would be little or no treatment residuals. The only potential treatment residual is spent activated carbon; if carbon is used to polish the liquid stream. This carbon would be sent off-site for regeneration or disposal.

Cost for this alternative includes air stripping and quarterly groundwater monitoring for 10 years. This includes energy, equipment maintenance, and replacement of spent carbon and filter beds.

Groundwater monitoring is included as an element of this remedy until ARARs are achieved. Restriction of this property as a daycare facility will remain.

## *9.0 EVALUATION OF ALTERNATIVES*

During the detailed evaluation of remedial alternatives at SEAD-25 and SEAD-26, each alternative was assessed against nine evaluation criteria, namely, 1) overall protection of human health and the environment, 2) compliance with applicable or relevant and appropriate requirements (ARAR)s, 3) long-term effectiveness and permanence, 4) reduction of toxicity, mobility, or volume, 5) short-term effectiveness, 6) implementability, 7) cost, 8) state acceptance and 9) community acceptance. **Tables 4** and **5** provide summaries of each alternative for SEAD-25 and SEAD-26 and how each alternative complies with these requirements. A comparative analysis of these alternatives based upon these evaluation criteria is presented below for each of the sites. Since the completion of the FS, some of the alternatives have been revised slightly and, therefore, the descriptions and costs of the alternatives may differ slightly from the FS. These revisions are noted in the discussion of the individual alternatives. Due to the increased importance of property transfer at the site and changes made to the cost estimates to make them more location specific, the overall ranking of the alternatives has changed at SEAD-25. It is important to note that the revised alternatives RA25-4 and RA25-4R complied with the nine evaluation criteria in the same manner as the original alternatives that were analyzed in the FS.

### 9.1 SEAD-25

#### 9.1.1 Overall Protectiveness of Human Health and the Environment

Overall protection of human health and the environment is a threshold criteria because each alternative must meet this in order to be carried through the ranking process. With the exception of the RA25-1 (No-action), which was retained for comparative purposes, all the alternatives were rated highly for protectiveness of human health and the environment.

Table 5-1A in the FS presents human risk predicted at the site after implementation of each of the above alternatives compared to the risk calculated in the baseline risk assessment. Risk was calculated not only for the intended use of the site (industrial), but also for the future residential scenario. By recalculating human health risks as performed in the Remedial Investigation after attaining the clean-up goals set forth in Section 2.0 of the RI, human health risk will be acceptable for both the current site worker and future on-site construction worker under Alternatives RA25-3, RA25-3A, RA25-4, RA25-5, and RA25-6. Human health risk would remain unacceptable for the future on-site construction worker under Alternative RA25-1 and RA25-2 since the remediation of site soils would not be addressed. In addition, human health risk would be acceptable to a future resident under alternatives RA25-3R, RA25-3AR, and RA25-4R.

#### 9.1.2 Compliance With ARARs

Compliance with ARARs is a threshold criteria because each alternative must meet this to be carried through the ranking process. With the exception of the RA25-1 (No-action), which was retained for comparative purposes, all the alternatives were rated highly for ARAR compliance. Although RA25-2 is in compliance with ARARs, it would require a relatively long period of time to meet remediation standards. While the more aggressive alternatives would achieve ARAR compliance sooner than other approaches employing natural mechanisms, all are expected to comply with ARARs and clean-up goals.

#### 9.1.3 Long-Term Effectiveness and Permanence

The criterion of long-term effectiveness addresses the long-term protectiveness to human health and the environment, permanence of the remedial alternative, magnitude of remaining risk and adequacy and reliability of controls. Alternative RA25-3 (Bioventing of Soil and Air Sparging of Plume) ranked highest for long-term effectiveness because it ranks as a permanent solution, and is considered an on-site treatment. Currently there is no off-site migration of the groundwater plume, and there would be long-term groundwater monitoring to assess its movement. Once the groundwater and soil at the site meet the treatment criteria, the remedial action would be considered permanent.

Alternative RA25-3A (Bioventing of Soil and Natural Attenuation of Plume) ranked just below RA25-3 because of the longer term groundwater monitoring required. Since this alternative addresses the source of the release of volatiles to groundwater, natural attenuation of groundwater is considered

to offer greater permanence than those alternatives where the source is not addressed.

Alternatives RA25-4 (Source Removal, Off-site Disposal, & Long-Term Monitoring of Plume), RA25-4R, which includes sediment removal, RA25-5 (Source Removal, Off-site Disposal, & Air Stripping of Plume) and RA25-6 (Source Removal, Off-site Disposal, & Air Sparging of Plume) scored lower since the soil at the site would not be treated, and, consequently, the remedial action for soil does not constitute a permanent solution. However, for alternative RA25-4 (and subsequently RA25-4R, which includes sediment removal), air stripping of the groundwater removed during the excavation would provide a permanent solution to the most chemically impacted portion of the plume. Additionally, it is noted that under RA25-5 and RA25-6, once the groundwater at the site meets the treatment criteria, the remedial action would be considered permanent.

Alternative RA25-2 (Institutional Controls and Natural Attenuation of Plume) ranked the lowest because there is no on-site treatment. In the source area, chemicals are expected to continue to leach to the groundwater, and if impacts are realized in off-site locations, remediation may be required at a later date. Therefore, this alternative is not considered permanent.

The goal of all remedial alternatives is to have no residual contamination in soils above TAGM levels. After the remedial action, residual contamination would be assessed, with the aim that no contamination would remain above TAGM levels. Residual groundwater contamination would be monitored to ensure that the plume is biodegrading.

### 9.1.4 Reduction in Toxicity, Mobility or Volume

SEAD-25 alternatives were ranked relative to the decreases in the volume/toxicity, mobility, and permanence of the hazardous constituents present at the site.

The No-action alternative (RA25-1) and RA25-2 (Institutional Controls and Natural Attenuation of Plume) ranked the lowest in this category because these alternatives do not effectively reduce the volume, toxicity, or mobility of the hazardous constituents at the site. While natural attenuation in alternative RA25-2 would reduce the toxicity and volume of the chemicals onsite in the groundwater, any reduction would need to be documented via long-term monitoring.

RA25-3 (Bioventing of Soil and Air Sparging of Plume) and RA25-3A (Bioventing of Soil and Natural Attenuation) and corresponding alternatives RA25-3R and RA25-3AR, which include sediment removal, ranked the highest in this category because they both effectively reduce the volume/toxicity and mobility of the hazardous constituents in both soil and groundwater using on-site treatment technologies. RA25-4 (Source Removal, Off-Site Disposal and Long-Term Monitoring of Plume), RA25-4R, which includes sediment removal, RA25-5 (Source Removal, Off-Site Disposal, and Air Stripping of Plume), and RA25-6 (Source Removal, Off-Site Disposal, and Sparging of Plume) ranked lower because they rely on a non-destructive technology (excavation) as the remedial action for on-site soils.

RA25-3 (Bioventing of Soil and Air Sparging of Plume) and RA25-3A (Bioventing of Soil and Natural Attenuation of Plume) and corresponding alternatives RA25-3R and RA25-3AR, which include sediment removal, ranked the highest for reduction in mobility of wastes because they treat both the soils and groundwater and, therefore, reduce the overall volume of wastes at the site by 90-100%. In alternatives RA25-3 and RA25-3R, air sparging would reduce the volume of impacted groundwater through in-situ treatment. For RA25-3, RA25-3R, RA25-3A, and RA25-3AR, bioventing would reduce the volume of impacted soil and eliminate the source of volatile organics to groundwater. The toxicity of the chemicals present in the groundwater would be diminished through aerobic biodegradation in the aquifer.

Alternatives RA25-4, RA25-4R, RA25-5 and RA25-6 were ranked moderately effective at reducing the toxicity, mobility, or volume at the site. The air stripping action in RA25-5 would effectively reduce the mobility, toxicity, and volume of the hazardous constituents present in groundwater at the site. The interceptor trenches would effectively eliminate the mobility of the plume, and ensure that no off-site migration occurs. The volume of contaminated groundwater would decrease over time as the organics are removed. The air sparging alternative (RA25-6) would reduce the volume of chemically impacted groundwater through an in-situ treatment. The toxicity of the constituents present in the groundwater would be diminished through aerobic biodegradation and volatilization. However, RA25-4, RA25-4R, RA25-5 and RA25-6 do not reduce the mobility of hazardous constituents significantly because of the off-site landfilling of source soils and, therefore, they rank slightly lower in this category.

RA25-1 and RA25-2 rank the lowest in this category because they essentially do not effectively treat either soils or groundwater.

All of the alternatives that involve active treatment are considered permanent once the remedial action objectives are met. Alternative RA25-3 (Bioventing of Soil and Air Sparging of Plume) and RA25-3A (Bioventing of Soil and Natural Attenuation of Plume) and corresponding alternatives RA25-3R and RA25-3AR, which include sediment removal, received the highest ranking rating because they would permanently destroy all the constituents of concern. The No-action alternative

received the lowest score because most of the contaminants would not be treated or removed. The remaining alternatives (RA25-2, RA25-4, RA25-4R, RA25-5, and RA25-6) received equal ranking because they would involve excavation and off-site disposal of soils.

### 9.1.5 Short-Term Effectiveness

Alternative RA25-1 (No-action) and RA25-2 (Institutional Controls and Natural Attenuation of Plume) were ranked highest for short-term protection of human health and the environment. Neither of these alternatives requires any construction of remedial systems and, therefore, poses the least risk to the community and on-site workers and, in addition, they do not create any adverse environmental impacts. These alternatives would, however, take longer to achieve the remedial response action objectives than other alternatives evaluated.

Alternatives RA25-3 (Bioventing of Soil and Air Sparging of Plume), RA25-3A (Bioventing of Soil and Natural Attenuation of Plume), and RA25-4 (Source Removal, Off-site Disposal, & Long-Term Monitoring of Plume) and corresponding alternatives RA25-3R, RA25-3AR, RA25-4R, which include sediment removal, were rated equally and ranked slightly below alternative RA25-2 (Institutional Controls and Natural Attenuation of Plume). Under a residential scenario, access control would minimize the possibility of exposure to contaminants. For construction workers, exposure could be minimized by the use of proper protective equipment, such as respirators, dust masks, and Tyvek protective clothing. Dust generation at the excavation can be minimized by using water or other dust control chemicals. Air monitoring may be used to determine if there is a significant threat from the inhalation of vapors or particulates. Site workers would be required to meet all the OSHA training and medical monitoring requirements prior to working on-site. Short-term protectiveness must also consider environmental impacts during the remedial action. The SEDA boundary is at a distance of approximately 1500 feet, and the likelihood of any dust migrating off-site is negligible. There is little potential for release of hazardous constituents during remedial action. VOC emissions from the air stripper are not a concern due to the low level of volatiles in groundwater. There are no sensitive environments that would be disturbed by the construction activities.

Alternatives RA25-5 (Source Removal, Off-site Disposal, and Air Stripping of Plume) and RA25-6 (Source Removal, Off-site Disposal, and Air Sparging of Plume) ranked just below RA25-3, RA25-3A, RA25-4 and their residential counterparts because they involve excavation of the source soils, which would lower short-term protection to workers, and involve treatment technologies that result in the volatilization of organic contaminants. The techniques previously mentioned to limit exposure to contaminants for residents and site-workers could also be utilized for RA25-5 and RA25-6. In general, all the alternatives scored relatively high for short-term protection.

### 9.1.6 Implementability

The alternatives carried to the detailed analysis score well on implementability. For technical implementability in the FS report, alternatives RA25-1 (No action), RA25-3A (Bioventing of Soil and Natural Attenuation of Plume) including its residential counterpart RA25-3AR, and RA25-4 (Source Removal, Off-Site Disposal, and Long-Term Monitoring of Plume) including its residential counterpart RA25-4R, scored slightly higher than the other alternatives due to the ease of construction (either no construction at all, or no construction to address groundwater contamination). Although the technical feasibility of RA25-3A and RA25-3AR is good, there are uncertainties associated with innovative in-situ technologies and the ability of naturally occurring bacteria to breakdown these chemicals. Since the FS was written, the transfer of property at the base has gained increased importance. If the property at SEAD-25 were to be transferred in the near future, alternative RA25-4 and RA25-4R may be more easily implemented since it has no long-term system to operate or maintain. In addition, the technical feasibility of RA25-4 and RA25-4R is extremely favorable since excavation and air stripping are well established, reliable technologies that are readily available.

Alternative RA25-2 (Institutional Controls and Natural Attenuation of Plume) ranked slightly lower since this future remedial action may be necessary due to the continued presence of the source soils. Alternatives RA25-3, RA25-3R, RA25-5, and RA25-6 ranked lowest due to the uncertainties associated with air sparging (i.e., mounding, effects of fluctuating groundwater table) and implementing groundwater collection in a collection trench. The sparging may also require field scale pilot testing.

All alternatives were ranked equally as requiring "normal coordination" with agencies and for obtaining necessary permits and approvals.

All the alternatives scored equally for availability of services and materials.

### 9.1.7 Cost

Capital costs and operating and maintenance costs were estimated for the ten remedial action alternatives. Capital costs include those costs for professional labor, treatability study costs, construction and equipment costs, site work, monitoring and testing, and treatment and disposal costs. Operating costs include administrative and professional labor costs, monitoring, and utilities. Administrative costs include the costs for restricting future land use to non-residential. All costs discussed

are present worth estimates using a common discount rate of 5%. Table 5-2 in the FS summarizes the capital and operating costs for alternatives RA25-1 through RA25-6, however, these costs have been revised since the completion of the FS, as noted in earlier sections of this Plan and in **Table 4**.

Alternative RA25-1 (No-action) is not considered to have any associated capital or operating costs. This alternative is used as a basis of comparison for all other alternatives. RA25-5 (Source Removal, Off-Site Disposal, and Air Stripping of Plume) ranked the highest for costs as a result of its present worth costs of $1,057,500. The capital cost is $716,700 and includes equipment costs for the groundwater air stripping system, construction costs including those for excavation, site work, professional labor, engineering design, treatment of excavated groundwater, and disposal of contaminated soils. The operating and maintenance costs include costs for operation of the air stripping system for 1 year and monitoring for 5 years.

RA25-3 (Bioventing of Soil and Air Sparging of Plume), and its related residential alternative RA25-3R, ranked second highest for costs with total present worth costs of $1,083,500 and $1,109,500, respectively. Capital costs for these alternatives are estimated to be $373,500 and $422,300. These costs include equipment costs for a soil bioventing system and groundwater air sparging system, treatability studies, site work, professional labor, and engineering design and construction costs; the residential alternative also includes removal of sediment from the northwestern ditch. The operating costs include costs for operation of the bioventing system for 5 years and operation of the air sparging system for 10 years. RA25-3A, and its residential counterpart RA25-3AR, were ranked only slightly lower than RA25-3 and RA25-3R because the total present worth costs of these remedial action alternatives were estimated to be slightly higher at $1,149,200 and $1,167,300, respectively. The capital costs for these alternatives were estimated to be $236,400 and $285,200, which is slightly lower than the capital costs for RA25-3. However, the operating costs were estimated using a planned life of 15 years for monitoring the natural attenuation.

RA25-4 (Source Removal, Off-site Disposal, and Monitoring of the Plume) and its residential counterpart, RA25-4R ranked fairly low for cost in comparison to other alternatives. The capital costs include construction costs for the excavation of soils, site work, design, professional labor, treatment of excavated groundwater, and transportation and off-site disposal of soils. While the capital costs were lower than RA25-5, ($659,800 and $701,000 respectively) the operating costs are higher as a result of the long term monitoring costs for natural degradation. The operating costs for RA25-4 were estimated using a planned life of 10 years for monitoring the natural attenuation. The residential option has the added cost of sediment removal from the northwestern ditch.

RA25-6 (Source Removal, Offsite Disposal, and Air Sparging of Plume) ranked the lowest in terms of cost. The total present worth of this alternative was $1,475,700 and its capital cost was $682,100. This alternative is ranked lower than the others because of the cost of operating the groundwater air sparging system and the need to perform field-scale testing prior to the implementation of that system. The operating costs were estimated using a planned operation time of 10 years for the air sparging system and 10 years of monitoring.

RA25-2 (Institutional Controls and Natural Attenuation of Plume) ranked moderately in terms of costs compared to the other five alternatives other than the no-action alternative. This alternative has no capital construction costs other than fencing and professional labor. Operating costs are for annual groundwater monitoring with a planned life of 150 years. This is based upon groundwater modeling that suggests that concentrations of volatile organics would meet the GA groundwater standards in this time frame by natural attenuation. The total present worth cost for RA25-2 is $1,564,500.

### 9.1.8 State Acceptance

State acceptance of the preferred alternative will be addressed in the Record of Decision following review of the State comments received on the RI/FS Report and this Proposed Plan (Proposed Plan).

### 9.1.9 Community Acceptance

Community acceptance of the preferred alternative will be assessed in the Record of Decision following review of the public comments received on the RI/FS and this Proposed Plan (Proposed Plan).

## 9.2 SEAD-26

### 9.2.1 Overall Protectiveness of Human Health and the Environment

Overall protection of human health and the environment is a threshold criterion because each alternative must meet this to be carried through the process. With the exception of the No-Action alternative, which was retained for comparative purposes, all the alternatives were rated highly protective of human health and the environment. The Baseline Risk Assessment (BRA) performed as part of the Remedial Investigation (RI) indicates that, in the short-term, the No-action alternative is protective of human health, since the calculated carcinogenic risk for current site workers is $1.1 \times 10^{-6}$, which is at the lower end of the USEPA target risk range. The non-carcinogenic risk (HI) of 0.004 is less than the criterion of 1.0

and is protective of human health. According to the baseline risk assessment, ecological risk at this site is negligible.

The No-action alternative scored poorly for protection of the environment due to the lack of monitoring incorporated into this alternative.

### 9.2.2 Compliance With ARARs

Compliance with ARARs is a threshold criterion because each alternative must meet this in order to be carried through the process. With the exception of the No-Action alternative, which was retained for comparative purposes, all the alternatives were rated highly for ARAR compliance. While the more aggressive alternatives will achieve ARAR compliance sooner than approaches employing natural mechanisms, all are expected to comply with ARARs and clean-up goals.

### 9.2.3 Long-Term Effectiveness and Permanence

The criterion of long-term effectiveness addresses the long-term protectiveness to human health and the environment. Most of the evaluated alternatives are highly effective in eliminating the long-term threats. The results of the BRA indicate that for current and intended future use of this site, the risks are within the USEPA target range for carcinogenic risks and below the acceptable target value for non-carcinogenic risks. Under a residential scenario, the child receptor experiences unacceptable risk. The environmental risk assessment concluded there was negligible risk at SEAD-26 to the environment. Because BTEX compounds exceed ARARs in the groundwater, the no-action alternative is not protective of the environment and ranked lowest. Alternatives RA26-2 through RA26-4 were rated equally for long-term effectiveness. All are expected to achieve clean-up goals and provide permanent solutions.

### 9.2.4 Reduction in Toxicity, Mobility or Volume

Alternatives have been compared relative to the decreases in the volume/toxicity, mobility, and permanence of the hazardous constituents present at the site.

With the exception of RA26-1 (No-action), all the alternatives received the same score for volume/toxicity reduction. The No-action alternative was ranked lowest because there is no-action taken to monitor ARAR exceedances. All of the other alternatives effectively reduce the volume and/or toxicity of contaminants at the site. However, the No Action alternative will not monitor contaminants on-site, whereas the other alternatives will be shown to meet clean-up goals prior to their completion. The primary difference between the alternatives is the time to achieve the reductions. According to groundwater modeling results, Alternative RA26-2 (Institutional Controls and Monitoring of Plume) would reduce BTEX levels in groundwater to clean-up goal levels in 20 years. Alternative RA26-3 (Air Sparging of Plume) and RA26-4 (Air Stripping of Plume) are expected to meet the clean-up goals sooner (conservatively estimated at 10 years). RA26-3 would reduce the toxicity of the constituents present in the groundwater through aerobic biodegradation and volatilization in the aquifer. Air stripping the plume (RA26-4) would decrease the volume of contaminated groundwater over time as organics are removed.

The No-action alternative scored lowest for reduction in mobility because when the alternative is complete there will still be contaminants in the groundwater capable of migrating off-site. However, even with No-action, off-site migration is unlikely. The remaining alternatives were equally rated because they all prevent the migration of contaminants off-site.

In terms of permanence, the no-action alternative was rated lowest due to the lack of destruction of contaminants upon completion. The remaining alternatives effectively provide permanent destruction of the contaminants of concern once the remedial action objectives have been obtained.

### 9.2.5 Short-Term Effectiveness

Alternative RA26-1 (No-action) ranked highest in terms of short-term protection of human health and the environment. This is due to the low risk to human health and the environment that the site currently poses. Administrative and land use controls currently in place also contribute to the short-term effectiveness. Alternatives RA26-2 through RA26-4 were rated equally in terms of short-term effectiveness. They were ranked slightly lower due to the time required to implement the remedy. RA26-2 (Institutional Controls and Monitoring of Plume) is expected to take 20 years to meet ARAR levels for BTEX in groundwater. Alternative RA26-3 (Air Sparging of Plume) and RA26-4 (Air Stripping of Plume) were also ranked slightly lower than the No-action alternative due to the potential treatment time. Protection from exposure can be minimized through site access controls and the use of proper protective equipment for site workers, such as respirators, dust masks and Tyvek protective clothing. Air monitoring may be used to determine if there is a significant threat from the inhalation of vapors or particulates. Dust generation at the excavation can be minimized by using water or other dust control chemicals. It should also be noted that all the site workers would be required to meet all the OSHA training and medical monitoring requirements prior to working on-site. There is little potential for release of hazardous constituents during the remedial action.

### 9.2.6 Implementability

The alternatives carried to the detailed analysis score well on implementability. For technical feasibility, alternative RA26-1 (No-action) scored highest due the lack of technical concerns.

Alternative RA26-2 (Institutional Controls and Monitoring of Plume) rated slightly lower than the No-action alternative due to the uncertainties associated with natural biodegradation of contaminants in groundwater. Alternative RA26-3 (Air Sparging of Plume) and RA26-4 (Air Stripping of Plume) were rated lower due to the difficulties associated with setting up the groundwater treatment system and implementing groundwater collection in a groundwater trench.

All of the other alternatives were rated as "required coordination is normal" because each option can be expected to require coordination with other offices and agencies (e.g., obtaining permits for off-site activities or rights-of-way for construction).

All the alternatives scored equally high on the issue of availability of services and materials. None of the alternatives pose a challenge from this standpoint.

### 9.2.7 Cost

The last criterion to compare is cost. This comparison evaluated the present worth costs of the alternatives. The capital, present worth annual and total present worth costs are presented in Table 6-2 of the FS.

The least expensive alternative is RA26-1 (No-action) which has no costs associated with it. RA26-2 (Institutional Controls and Monitoring of Plume) rated second in terms of cost because it only includes controls to temporarily restrict access to groundwater and quarterly groundwater monitoring. These tasks could be performed by local vendors using local materials. The most expensive alternative is the RA26-4 (Air Stripping of Plume) due to the present worth costs of constructing an air stripping system. However, if an alternative employing air stripping is selected for SEAD-25, the possibility of transporting the small volume of contaminated groundwater from SEAD-26 to the SEAD-25 treatment unit should be considered. Due to the limited level of groundwater impacts present at the site, the O&M costs for the air sparging alternative is relatively low.

### 9.2.8 State Acceptance

State acceptance of the preferred alternative will be addressed in the Record of Decision following review of the State comments received on the RI/FS Report and this Proposed Plan.

### 9.2.9 Community Acceptance

Community acceptance of the preferred alternative will be assessed in the Record of Decision following review of the public comments received on the RI/FS and this Proposed Plan.

## *10.0 PREFERRED ALTERNATIVE*

### 10.1 SEAD-25

The results of the RI show that soil and groundwater are the media of concern. The contaminants of concern are presented in **Tables 1A** and **1B** for soil, and in **Table 1C** for groundwater. Remedial action alternatives were prepared independently for the removal of hazardous chemicals at the Fire Training and Demonstration Pad (SEAD-25). In October 1997, the Local Redevelopment Authority had determined that the planned future use of this site is industrial, however, a residential scenario was considered. The baseline human health risk assessment indicates that potential future on-site residents and future on-site construction workers are the receptors exhibiting excess risk of cancer above the USEPA target range and a potential for non-carcinogenic effects. The cleanup goals for both media are listed in **Table 3A**. The goal of the remedial action is to have no residual contamination in soil above TAGM levels and to remove the risk to human health.

Based on the evaluation of the various options, the U.S. Army recommends Alternative RA25-4R (Source Removal, Off-site Disposal, Long-Term Monitoring of Plume, and Sediment Removal) (**Figure 2**). The elements that compose this remedy include:

- Excavate soil at the source in an area approximately 60 feet by 100 feet to a depth of 6 feet (approximately 1,350 cubic yards (CY));
- Excavate a volume of sediment approximately 780 feet long, 3 feet wide, and 2 feet deep (175 CY) from the northwest ditch;
- Dewater the excavation pit;
- Treat groundwater at the source that is recovered during excavation and during dewatering of excavation pit with an onsite air stripper;
- Replace excavated soil with clean backfill;
- Conduct quarterly groundwater monitoring of the plume for 10 years;
- Establish and maintain land use controls to restrict public access to the site groundwater until clean up goals are achieved; and
- Complete five-year reviews.

The clean up goals for groundwater at the site are NYSDEC Class GA groundwater standards. These standards are based on USEPA Maximum Contaminant Levels (MCLs) developed for drinking water. Until the contaminant levels in the groundwater meet these clean up goals, a land use control (or institutional control) in the form of a groundwater use restriction will be a part of the remedy. The goal of the land use control is to ensure adequate protection of human health and the environment, and to preserve and promote the long-term effective operation of remedial alternatives proposed for the sites. A public water

supply is available, thus a groundwater restriction should have minimal impact on land reuse of the site. Upon land transfer, there will be language in the deed that requires the continued use of institutional controls. At a minimum, the deed may prohibit the following:

- The installation of any groundwater extraction wells, except for regulator-approved remediation purposes.
- Human or ecological exposure to groundwater from the site(s), or use of this groundwater for any industrial, commercial, sanitary, human consumptive, or agricultural purposes.
- Unauthorized interference (to be defined in the deed) with existing monitoring systems or any additional treatment or monitoring systems that may be subsequently constructed at the site(s) (these systems to be described and locations specified in the deed to the extent practicable.)

In addition, language will be included in the deed notifying future users that site-related contaminants exist and remain in the adjacent roadside ditch (along Administration Avenue) at SEAD-25. It will be noted, however, that site-related contaminants do not contribute to an unacceptable risk at the site.

The present worth cost of this alternative is $1,133,800. The capital cost and the O&M cost of RA25-4R are $701,000 and $432,800, respectively.

This alternative was selected as the preferred alternative since it eliminates source soils from further impacting groundwater at the site, eliminates sediments that contribute to human health risk, and effectively treats the most highly impacted groundwater at the site. This alternative does not require any treatability or pilot studies as other alternatives do, and does not require any long-term operating system, while maintaining its effectiveness. In addition, the U.S. Army believes that in selecting this alternative, property transfer at this site may be expedited since the time to implement this remedy is relatively short. The combination of removing the soils and sediments from the site so that the source of contamination no longer exists, and ensuring that any contamination left is not allowed to migrate, ranked as one of the highest remedies for effectiveness and implementability among the other alternatives considered. While it is not the most cost-effective solution, it will provide an effective solution requiring the least amount of operation and maintenance.

### 10.2 SEAD-26

The results of the RI show that groundwater is the media of concern. The contaminants of concern in groundwater are presented in **Table 2C**. Remedial action alternatives were prepared independently for the removal of contaminants at the Fire Training Pit and Area (SEAD-26). All of the alternatives described above would be effective for the use of SEAD-26 as an industrial site. The baseline human health risk assessment indicates that potential future on-site child resident exhibits a potential for non-carcinogenic effects. The cleanup goals for groundwater are listed in **Table 3B**.

Based on the evaluation of the various options, the U.S. Army recommends Alternative RA26-2 (Institutional Controls and Monitoring of Plume) (**Figure 4**). The preferred remedy consists of the following elements:

- Conduct annual groundwater monitoring of the plume for 20 years;
- Establish and maintain institutional controls to restrict public access to the site groundwater until clean up goals are achieved and prohibit use of the property as a daycare facility; and
- Complete five-year reviews.

The clean up goals for groundwater at the site are NYSDEC Class GA groundwater standards. These standards are based on USEPA Maximum Contaminant Levels (MCLs) developed for drinking water. Until the contaminant levels in the groundwater meet these clean up goals, a land use control (or institutional control) in the form of a groundwater use restriction will be a part of the remedy. The goal of the land use control is to ensure adequate protection of human health and the environment, and to preserve and promote the long-term effective operation of remedial alternatives proposed for the sites. A public water supply is available, thus a groundwater restriction should have minimal impact on land reuse of the site. Upon land transfer, there will be language in the deed that requires the continued use of institutional controls. At a minimum, the deed may prohibit the following:

- The installation of any groundwater extraction wells, except for regulator-approved remediation purposes.
- Human or ecological exposure to groundwater from the site(s), or use of this groundwater for any industrial, commercial, sanitary, human consumptive, or agricultural purposes.
- Unauthorized interference (to be defined in the deed) with existing monitoring systems or any additional treatment or monitoring systems that may be subsequently constructed at the site(s) (these systems to be described and locations specified in the deed to the extent practicable.)
- Use of the land as a daycare facility.

The present worth cost of this alternative is $389,100. The capital cost and the O&M cost of RA26-2 are $72,300 and $316,700, respectively.

This alternative was selected as the preferred alternative because, in light of the acceptable risks on the site, institutional controls would be effective in preventing access to the site. In addition, because the groundwater is impacted by relatively low concentrations of volatile organics in the one well on-site, it would be suitable for monitoring and natural biodegradation.

This alternative ranks high for protection of the environment, ARAR compliance, and short and long-term effectiveness, but it is also ranked highest for implementability (technical feasibility) and cost, although it has a longer time until the action is complete.

## *GLOSSARY*

***Aquifer***
An aquifer is a saturated permeable geologic unit or rock formation that can store significant quantities of water and transmit the water under ordinary hydraulic gradients, possibly to wells.

***Adsorption***
Adsorption is the adhesion of molecules of gas, liquid, or dissolved solids to a surface. The term also refers to a method of treating wastes in which activated carbon removes organic matter from wastewater.

***Air Sparging***
In air sparging, air is injected into the ground below a contaminated area, forming bubbles that rise and carry trapped and dissolved contaminants to the surface where they are captured by a soil vapor extraction system. Air sparging may be a good choice of treatment technology at sites contaminated with solvents and other VOCs. *See also Soil Vapor Extraction and Volatile Organic Compound.*

***Air Stripping***
Air stripping is a treatment system that removes or "strips" VOCs from contaminated groundwater or surface water as air is forced through the water, causing the compounds to evaporate. *See also Volatile Organic Compound.*

***Ambient Water Quality Standards (AWQS)***
Standards and guidance values developed by New York State for specific classes of fresh and saline surface waters and fresh groundwaters for protection of the best uses assigned to each class.

***Applicable or Relevant and Appropriate Requirements (ARARs)***
As defined under CERCLA, ARARs are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limits set forth under federal or state law that specifically address problems or situations present at a CERCLA site. ARARs are major considerations in setting cleanup goals, selecting a remedy, and determining how to implement that remedy at a CERCLA site. ARARs must be attained at all CERCLA sites unless a waiver is attained. ARARs are not national cleanup standards for the Superfund program. *See also Comprehensive Environmental Response, Compensation, and Liability Act and Superfund.*

***Army Corps of Engineers (USACOE)***
The engineering organization of the U.S. Army. The districts involved in the Seneca Army Depot Activity project include: the New York District (CENAN), the New England District (CENED), the Huntsville Center for Engineering Support (CEHNC).

***Base Realignment and Closure (BRAC)***
A congressionally mandated process that involves closure of military bases. The goal of BRAC is to transition the former bases from military uses to civilian reuse, with the intent of minimizing the negative effects of base closure by spurring economic development and growth. The SEDA was listed as a base to be closed in October, 1995.

***Baseline Risk Assessment***
A baseline risk assessment is an assessment conducted before cleanup activities begin at a site to identify and evaluate the threat to human health and the environment. After remediation has been completed, the information obtained during a baseline risk assessment can be used to determine whether the cleanup levels were reached.

***Bedrock***
Bedrock is the rock that underlies the soil; it can be permeable or non-permeable. The underlying bedrock as the Seneca Army Depot Activity is shale. *See also Confining Layer.*

***Bioremediation***
Bioremediation refers to treatment processes that use microorganisms (usually naturally occurring) such as bacteria, yeast, or fungi to break down hazardous substances into less toxic or nontoxic substances. Bioremediation can be used to clean up contaminated soil and water. In situ bioremediation treats the contaminated soil or groundwater in the location in which it is found. For ex situ bioremediation processes, contaminated soil must be excavated or groundwater pumped to the surface before they can be treated.

***Borehole***
A borehole is a hole cut into the ground by means of a drilling rig.

***BTEX***
BTEX is the term used for benzene, toluene, ethylbenzene, and xylene-volatile aromatic compounds typically found in petroleum products, such as gasoline and diesel fuel.

***Cadmium***
Cadmium is a heavy metal that accumulates in the environment. *See also Heavy Metal.*

***Cancer Slope Factor***
The slope factor is a plausible upper-bound estimate of the probability of a response per unit intake of a chemical over a lifetime. The slope factor is used in risk assessments to estimate an upper-bound lifetime probability of an individual developing cancer as a result of exposure to a particular level of a potential carcinogen. Slope factors for each chemical are expressed in units of inverse mg chemical per kg body weight per day of exposure.

***Capital Cost***
The initial cost associated with constructing a treatment remedy. The capital cost does not include the operation and maintenance of the remedy.

***Carbon Adsorption***
Carbon adsorption is a treatment system that removes contaminants from groundwater or surface water as the water is forced through tanks containing activated carbon.

***Chlorinated Ethenes***
A group of volatile chlorinated organic compounds that includes tetrachloroethene, trichloroethene, dichloroethene and vinyl chloride.

***Cleanup***
Cleanup is the term used for actions taken to deal with a release or threat of release of a hazardous substance that could affect humans and or the environment. The term sometimes is used interchangeably with the terms remedial action, removal action, response action, or corrective action.

***Clean Water Act (CWA)***
CWA is a 1977 amendment to the Federal Water Pollution Control Act of 1972, which set the basic structure for regulating discharges of pollutants to U.S. waters. This law gave USEPA the authority to set wastewater discharge standards on an industry-by-industry basis and to set water quality standards for all contaminants in surface waters.

***Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)***
CERCLA is a federal law passed in 1980 that created a special tax that funds a trust fund, commonly known as Superfund, to be used to investigate and clean up abandoned or uncontrolled hazardous waste sites. CERCLA required for the first time that USEPA step beyond its traditional regulatory role and provide response authority to clean up hazardous waste sites. USEPA has primary responsibility for managing cleanup and enforcement activities authorized under CERCLA. Under the program, USEPA can pay for cleanup when parties responsible for the contamination cannot be located or are unwilling or unable to perform

the work, or take legal action to force parties responsible for contamination to clean up the site or reimburse the federal government for the cost of the cleanup. *See also Superfund.*

***Contaminant***
A contaminant is any physical, chemical, biological, or radiological substance or matter present in any media at concentrations that may result in adverse effects on air, water, or soil.

***Data Quality Objective (DQO)***
DQOs are qualitative and quantitative statements specified to ensure that data of known and appropriate quality are obtained. The DQO process is a series of planning steps, typically conducted during site assessment and investigation that is designed to ensure that the type, quantity, and quality of environmental data used in decision-making are appropriate. The DQO process involves a logical, step-by-step procedure for determining which of the complex issues affecting a site are the most relevant to planning a site investigation before any data are collected.

***Dechlorination***
Dechlorination, the process used primarily to treat and destroy halogenated aromatic contaminants, is the chemical reaction that removes halogens (usually chlorine) from the primary structure of the contaminating organic chemical. Dechlorination can treat contaminated liquids, soils, sludges, and sediments, as well as halogenated organics and PCBs, pesticides, and some herbicides.

***Detection Limit***
The lowest concentration of a chemical that can be distinguished reliably from a zero concentration.

***Dichloroethene***
A group of volatile chlorinated organic compounds that include: 1,1-dichloroethene, cis 1,2-dichloroethene and trans 1,2-dichloroethene

***Disposal***
Disposal is the final placement or destruction of toxic, radioactive or other wastes; surplus or banned pesticides or other chemicals; polluted soils; and drums containing hazardous materials from removal actions or accidental release. Disposal may be accomplished through the use of approved secure landfills, surface impoundments, land farming, deep well injection, or ocean dumping.

***Engineered Control***
An engineered control, such as barriers placed between a contaminated area and the rest of a site, is a method of managing environmental and health risks. Engineered controls can be used to limit exposure pathways.

***Environmental Protection Agency (USEPA)***
The federal regulatory agency responsible for enforcing the rules and regulations of the United States. Representatives from the USEPA Region 2, which includes New York State, are involved in the review and oversight of the environmental work being conducted at the Seneca Army Depot Activity.

***Environmental Risk***
Environmental risk is the chance that human health or the environment will suffer harm as the result of the presence of environmental hazards.

***Expanded Site Investigation (ESI)***
An expanded investigation that typically includes media sampling and analyses. An ESI is performed following a Preliminary Site Investigation to obtain more information regarding the concentrations of pollutants at a site.

***Exposure Pathway***
An exposure pathway is the route of contaminants from the source of contamination to potential contact with a medium (air, soil, surface water, or groundwater) that represents a potential threat to human health or the environment. Determining whether exposure pathways exist is an essential step in conducting a baseline risk assessment. *See also Baseline Risk Assessment.*

***Federal Facilities Agreement (FFA) also known as the Interagency Agreement (IAG)***
An agreement signed between USEPA, NYSDEC and the Army that describes the process for identifying, investigating and remediating sites at the Seneca Army Depot Activity.

***Filtration***
Filtration is a treatment process that removes solid matter from water by passing the water through a porous medium, such as sand or a manufactured filter.

***GA Groundwater Standard***
A water quality standard promulgated by the NYSDEC that establishes a minimum quality of a groundwater supply that could be used as a source of drinking water.

***Groundwater***
Groundwater is the water that flows beneath the earth's surface, possibly in an aquifer, that fills pores between such materials as sand, soil, or gravel and that often supplies water to wells and springs. *See also Aquifer.*

***Heavy Metal***
The term heavy metal refers to a group of toxic metals including arsenic, chromium, copper, lead, mercury, silver, and zinc. Heavy metals often are present at industrial sites at which operations have included battery recycling and metal plating.

***Herbicide***
An herbicide is a chemical pesticide designed to control or destroy plants, weeds, or grasses.

***Hydrocarbon***
A hydrocarbon is an organic compound containing only hydrogen and carbon, often occurring in petroleum, natural gas, and coal

***Hydrogeology***
Hydrogeology is the study of groundwater, including its origin, occurrence, movement, and quality.

***Information Repository***
An information repository contains information about a Superfund site, including technical reports and reference documents and is located in a public building that is convenient for local residents, such as a public school, city hall, or library.

***Inorganic Compound***
An inorganic compound is a compound that generally does not contain carbon atoms (although carbonate and bicarbonate compounds are notable exceptions) and tends to be more soluble in water. Examples of inorganic compounds include various acids, potassium hydroxide, and metals.

***Innovative Technology***
An innovative technology is a process that has been tested and used as a treatment for hazardous waste or other contaminated materials, but lacks a long history of full-scale use and information about its cost and how well it works sufficient to support prediction of its performance under a variety of operating conditions. An innovative technology is one that is undergoing pilot-scale treatability studies that usually are conducted in the field or the laboratory and require installation of the technology, and provide performance, cost, and design objectives for the technology. Innovative technologies are being used under many federal and state cleanup programs to treat hazardous wastes that have been improperly released. For example, the innovative technology, reactive barrier wall,

is being evaluated to manage off-site migration of contamination. *See also Emerging Technology and Established Technology.*

***In Situ***
The term in situ, "in its original place," or" on-site", means unexcavated and unmoved. In situ soil flushing and natural attenuation are examples of in situ treatment methods by which contaminated sites are treated without digging up or removing the contaminants.

***Institutional Controls***
An institutional control is a legal or institutional measure, which subjects a property owner to limit activities at or access to a particular property. They are used to ensure protection of human health and the environment, and to expedite property reuse. Fences, posting or warning signs, and zoning and deed restrictions are examples of institutional controls.

***Integrated Risk Information System (IRIS)***
IRIS is an electronic database that contains USEPA's latest descriptive and quantitative regulatory information about chemical constituents. Files on chemicals maintained in IRIS contain information related to both noncarcinogenic and carcinogenic health effects.

***Land Disposal Restrictions (LDR)***
LDR is a RCRA program that restricts the land disposal of RCRA hazardous wastes and requires treatment to established treatment standards. LDRs may be an important ARAR for Superfund actions. *See also Applicable or Relevant and Appropriate Requirement and Resource Conservation and Recovery Act.*

***Landfill***
A sanitary landfill is a land disposal site for non-hazardous solid wastes at which the waste is spread in layers compacted to the smallest practical volume.

***Lead***
Lead is a heavy metal that is hazardous to health if breathed or swallowed. Its use in gasoline, paints, and plumbing compounds has been sharply restricted or eliminated by federal laws and regulations. *See also Heavy Metal.*

***Medium***
A medium is a specific environment (air, water, or soil) that is the subject of regulatory concern and activities.

***Mercury***
Mercury is a heavy metal that can accumulate in the environment and is highly toxic if breathed or swallowed. Mercury is found in thermometers, measuring devices, pharmaceutical and agricultural chemicals, chemical manufacturing, and electrical equipment. *See also Heavy Metal.*

***Methane***
Methane is a colorless, nonpoisonous, flammable gas created by anaerobic decomposition of organic compounds.

***Maximum Contaminant Level (MCL)***
Established under the Safe Drinking Water Act as concentrations of pollutants considered protective for drinking water.

***Migration Pathway***
A migration pathway is a potential path or route of contaminants from the source of contamination to contact with human populations or the environment. Migration pathways include air, surface water, groundwater, and land surface. The existence and identification of all potential migration pathways must be considered during assessment and characterization of a waste site.

***Monitoring Well***
A monitoring well is a well drilled at a specific location on or off a hazardous waste site at which groundwater can be sampled at selected depths and studied to determine the direction of groundwater flow and the types and quantities of contaminants present in the groundwater.

***National Contingency Plan (NCP)***
The NCP, formally the National Oil and Hazardous Substances Contingency Plan, is the major regulatory framework that guides the Superfund response effort. The NCP is a comprehensive body of regulations that outlines a step-by-step process for implementing Superfund responses and defines the roles and responsibilities of USEPA, other federal agencies, states, private parties, and the communities in response to situations in which hazardous substances are released into the environment. *See also Superfund.*

***National Priorities List (NPL)***
The NPL is USEPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial response under Superfund. Inclusion of a site on the list is based primarily on the score the site receives under the HRS. Money from Superfund can be used for cleanup only at sites that are on the NPL. USEPA is required to update the NPL at least once a year. *See also Hazard Ranking System and Superfund.*

***Natural Attenuation***
Natural attenuation is an approach to cleanup that uses natural processes to contain the spread of contamination from chemical spills and reduce the concentrations and amounts of pollutants in contaminated soil and groundwater. Natural subsurface processes, such as dilution, volatilization, biodegradation, adsorption, and chemical reactions with subsurface materials, are allowed to reduce concentrations of contaminants to acceptable levels. An in situ treatment method that leaves the contaminants in place while those processes occur, natural attenuation is being used to clean up petroleum contamination from LUSTs across the country.

***New York State Department of Environmental Conservation (NYSDEC)***
The state regulatory agency responsible for enforcing the rules and regulations of New York. Representatives from the headquarters in Albany and Region 8 are involved in the review and oversight of the environmental work being conducted at the Seneca Army Depot Activity.

***Nephelometric Turbidity Unit (NTU)***
A measurement unit of turbidity in water. Small particles of soil particles, such as clays or silts, become suspended within a water sample and increase the turbidity of the sample. This increase in turbidity has been identified as a source of increased metals concentration in samples. This effect is especially noticeable for groundwater samples collected within the clay-rich glacial till aquifer at the SEDA.

***Operation and Maintenance (O&M)***
O&M refers to the activities conducted at a site, following remedial actions, to ensure that the cleanup methods are working properly. O&M activities are conducted to maintain the effectiveness of the remedy and to ensure that no new threat to human health or the environment arises. Under the Superfund program, the state or PRP assumes responsibility for O&M, which may include such activities as groundwater and air monitoring, inspection and maintenance of the treatment equipment remaining on site, and maintenance of any security measures or institutional controls.

***Organic Chemical or Compound***
An organic chemical or compound is a substance produced by animals or plants that contains mainly carbon, hydrogen, and oxygen.

***Permeability***
Permeability is a characteristic that represents a qualitative description of the relative ease with which rock, soil, or sediment will transmit a fluid (liquid or gas).

***Pesticide***
A pesticide is a substance or mixture of substances intended to prevent or mitigate infestation by, or destroy or repel, any pest. Pesticides can accumulate in the food chain and or contaminate the environment if misused.

***Phenols***
A phenol is one of a group of organic compounds that are byproducts of petroleum refining, tanning, and textile, dye, and resin manufacturing. Low concentrations of phenols cause taste and odor problems in water; higher concentrations may be harmful to human health or the environment.

***Physical Separation***
Physical separation processes use different size sieves and screens to concentrate contaminants into smaller volumes. Most organic and inorganic contaminants tend to bind, either chemically or physically, to the fine fraction of the soil. Fine clay and silt particles are separated from the coarse sand and gravel soil particles to concentrate the contaminants into a smaller volume of soil that could then be further treated or disposed.

***Plume***
A plume is a visible or measurable emission or discharge of a contaminant from a given point of origin into any medium. The term also is used to refer to measurable and potentially harmful radiation leaking from a damaged reactor.

***Polychlorinated Biphenyl (PCB)***
PCBs are a group of toxic, persistent chemicals, produced by chlorination of biphenyl, that once were used in high voltage electrical transformers because they conducted heat well while being fire resistant and good electrical insulators. These contaminants typically are generated from metal degreasing, printed circuit board cleaning, gasoline, and wood preserving processes. Further sale or use of PCBs was banned in 1979.

***Polycyclic Aromatic Hydrocarbon (PAH)***
A PAH is a chemical compound that contains more than one fused benzene ring. They are commonly found in petroleum fuels, coal products, and tar.

***Potentially Responsible Party (PRP)***
A PRP is an individual or company (such as owners, operators, transporters, or generators of hazardous waste) that is potentially responsible for, or contributing to, the contamination problems at a Superfund site. Whenever possible, USEPA requires PRPs, through administrative and legal actions, to clean up hazardous waste sites they have contaminated. *See also Comprehensive Environmental Response, Compensation, and Liability Act and Superfund.*

***Proposed Plan***
The first step in the remedy selection process. The Proposed Plan provides information supporting the decisions of how the preferred alternative was selected. It summarizes the RI/FS process and how the alternatives comply with the requirements of the NCP and CERCLA. The Proposed Plan is provided to the public for comment. The responses to the Proposed Plan comments are provided in the ROD.

***Preliminary Assessment and Site Inspection (PA/SI)***
A PA/SI is the process of collecting and reviewing available information about a known or suspected hazardous waste site or release. The PA/SI usually includes a visit to the site.

***Present Worth Cost Analysis***
The equivalent future worth of money at the present time. By discounting all costs to a common base year, the costs for different remedial action alternative scan to be compared on the basis of a single figure for each alternative. This is a calculated value that requires the length of time that the future worth will be needed and the interest rate. For example, the present worth of a long-term operation and maintenance cost of a remedy is provided in terms of the present worth. Typically, a 30-year cost is required and an interest rate of 10%.

***Presumptive Remedies***
Presumptive remedies are preferred technologies for common categories of CERCLA sites that have been identified through historical patterns of remedy selection and USEPA's scientific and engineering evaluation of performance data on technology implementation.

***Pump and Treat***
Pump and treat is a general term used to describe remediation methods that involve the pumping of groundwater to the surface for treatment. It is one of the most common methods of treating polluted aquifers and groundwater.

***Quality Assurance (QA)***
QA is a system of management activities that ensure that a process, item, or service is of the type and quality needed by the user. QA deals with setting policy and implementing an administrative system of management controls that cover planning, implementation, and review of data collection activities. QA is an important element of a quality system that ensures that all research design and performance, environmental monitoring and sampling, and other technical and reporting activities conducted by USEPA are of the highest possible quality.

***Quality Control (QC)***
QC refers to scientific precautions, such as calibrations and duplications, that are necessary if data of known and adequate quality are to be acquired. QC is technical in nature and is implemented at the project level. Like QA, QC is an important element of a quality system that ensures that all research design and performance, environmental monitoring and sampling, and other technical and reporting activities conducted by USEPA are of the highest possible quality.

***Record of Decision (ROD)***
A ROD is a legal, technical, and public document that explains which cleanup alternative will be used at a Superfund NPL site. The ROD is based on information and technical analysis generated during the remedial investigation and feasibility study (RI/FS) and consideration of public comments and community concerns. *See also Preliminary Assessment and Site Investigation and Remedial Investigation and feasiln1ity Study.*

***Release***
A release is any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, leaching, dumping, or disposing into the environment of a hazardous or toxic chemical or extremely hazardous substance, as defined under RCRA. *See also Resource Conservation and Recovery Act.*

***Remedial Design and Remedial Action (RD/RA)***
The RD/RA is the step in the Superfund cleanup process that follows the RI/FS and selection of a remedy. An RD is the preparation of engineering plans and specifications to properly and effectively implement the remedy. The RA is the actual construction or implementation of the remedy. *See also Remedial Investigation and Feasibility Study.*

***Remedial Investigation and Feasibility Study (RI/FS)***
The RI/FS is the step in the Superfund cleanup process that is conducted to gather sufficient information to support the selection of a site remedy that will reduce or eliminate the risks associated with contamination at the site. The RI involves site characterization -collection of data and information necessary to characterize the nature and extent of contamination at the site. The RI also determines whether the contamination presents a significant risk to human health or the environment. The FS focuses on the development of specific response alternatives for addressing contamination at a site.

***Resource Conservation and Recovery Act (RCRA)***
RCRA is a federal law enacted in 1976 that established a regulatory system to track hazardous substances from their generation to their disposal. The law requires the use of safe and secure procedures in treating, transporting, storing, and disposing of hazardous substances. RCRA is designed to prevent the creation of new, uncontrolled hazardous waste sites.

***RfD***
The reference dose (RfD) is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious effects during a lifetime.

***Risk Communication***
Risk communication, the exchange of information about health or environmental risks among risk assessors, risk managers, the local community, news media and interest groups, is the process of informing members of the local community about environmental risks associated with a site and the steps that are being taken to manage those risks.

***Saturated Zone***
The saturated zone is the area beneath the surface of the land in which all openings are filled with water.

***Sediment Criteria***
Technical guidance provided by NYSDEC, the Division of Fish and Wildlife, that describes allowable sediment quality for a variety of chemicals. The values provided in this document have been adopted as screening levels for comparison to site data. Exceedances of these values provide that basis for further evaluation and decision-making.

***Semi-Volatile Organic Compound (SVOC)***
SVOCs, composed primarily of carbon and hydrogen atoms, have boiling points greater than 2000°C. Common SVOCs include PCBs and phenol *See also Phenol and Polychlorinated Biphenyl.*

***Seneca Army Depot Activity (SEDA)***
A 10,000-acre military facility, constructed in 1941, located in central New York responsible for storage and management of military commodities, including munitions. The depot is undergoing closure and will cease military operations in 2000. Environmental clean-up activities will continue until all sites have been addressed.

***Significant Threat***
The term refers to the level of contamination that a state would consider significant enough to warrant an action. The thresholds vary from state to state.

***Soil Boring***
Soil boring is a process by which a soil sample is extracted from the ground for chemical, biological, and analytical testing to determine the level of contamination present.

***Soil Gas***
Soil gas consists of gaseous elements and compounds that occur in the small spaces between particles of the earth and soil. Such gases can move through or leave the soil or rock, depending on changes in pressure.

***Soil Vapor Extraction (SVE)***
SVE, the most frequently selected innovative treatment at Superfund sites, is a process that physically separates contaminants from soil m a vapor form by exerting a vacuum through the soil formation. SVE removes VOCs and some SVOCs from soil beneath the ground surface.

***Solidification and Stabilization***
Solidification and stabilization are the processes of removing wastewater from a waste or changing it chemically to make the waste less permeable and susceptible to transport by water. Solidification and stabilization technologies can immobilize many heavy metals, certain radionuclides, and selected organic compounds, while decreasing the surface area and permeability of many types of sludge, contaminated soils, and solid wastes.

***Solid Waste Management Unit (SWMU)***
A SWMU is a RCRA term used to describe a contiguous area of land on or in which where solid waste, including hazardous waste, was managed. This includes landfills, tanks, land treatment areas, spills and other areas where waste materials were handled. Identification of all SWMUs at SEDA was performed as part of the RCRA Part B Permit Application process.

***Solvent***
A solvent is a substance, usually liquid, that is capable of dissolving or dispersing one or more other substances.

***Source Control***
This term refers to a group of alternatives that were assembled to address control the source of contamination. Most typically these alternatives involve addressing soil or sludge contamination.

***Subsurface***
Underground; beneath the surface.

***Surface Water***
Surface water is all water naturally open to the atmosphere, such as rivers, lakes, reservoirs, streams, and seas.

***Superfund***
Superfund is the trust fund that provides for the cleanup of hazardous substances released into the environment, regardless of fault. The Superfund was established under CERCLA and subsequent amendments to CERCLA. The term Superfund also is used to refer to cleanup programs designed and conducted under CERCLA and its subsequent amendments. *See also Comprehensive Environmental Response, Compensation, and Liability Act.*

***Superfund Amendment and Reauthorization Act (SARA)***
SARA is the 1986 act amending CERCLA that increased the size of the Superfund trust fund and established a preference for the development and use of permanent remedies, and provided new enforcement and settlement tools. *See also Comprehensive Environmental Response, Compensation, and Liability Act.*

***Target Compound List (TCL)***
The Target Compound List is a list of organic compounds that are required to analyzed when performing analytical procedures. The list includes volatile organic compounds, semi-volatile compounds, pesticides and PCBs.

***Technical Administrative Guidance Memorandum (TAGM)***
TAGMs are technical guidance publications provided by NYSDEC that describes various processes and procedures recommended by NYSDEC for the investigation and remediation of hazardous waste sites. One TAGM, No. 4046, provides guideline values for soil clean-up limits at waste sites.

***Toluene***
Toluene is a colorless liquid chemical with a sweet, strong odor. It is used as a solvent in aviation gasoline and in making other chemicals, perfumes, medicines, dyes, explosives, and detergents.

***Total Petroleum Hydrocarbon (TPH)***
TPH refers to a measure of concentration or mass of petroleum hydrocarbon constituents present in a given amount of air, soil, or water

***Toxicity***
Toxicity is a quantification of the degree of danger posed by a substance to animal or plant life.

***Toxicity Characteristic Leaching Procedure (TCLP)***
The TCLP is a testing procedure used to identify the toxicity of wastes and is the most commonly used test for degree of mobilization offered by a solidification and stabilization process. Under this procedure, a waste is subjected to a process designed to model the leaching effects that would occur if the waste was disposed of in a RCRA Subtitle D municipal landfill. *See also Solidification and Stabilization.*

***Treatability Testing / Demonstration Study***
Treatability testing is a process of collecting engineering performance data that will be used for final design purposes. In many instances treatability testing is performed to demonstrate the effectiveness of an innovative technology. A demonstration study has been on going at the Ash Landfill Operable Unit involving a zero-valence iron treatment wall.

***Trichloroethylene also known as Trichloroethene (TCE)***
TCE is a stable, low-boiling colorless liquid that is used as a solvent, metal degreasing agent, and in other industrial applications. It is a volatile chlorinated organic chemical.

***Unsaturated Zone***
The unsaturated zone is the area between the land surface and the uppermost aquifer (or saturated zone). The soils in an unsaturated zone may contain air and water.

***95$^{th}$ Upper Confidence Limit (UCL) of the Mean***
A statistical value that is calculated for a chemical in a specific media within a given data set. It represents a value that the true mean will not exceed, with a 95% statistical certainty. The 95$^{th}$ UCL is commonly used in risk assessment calculations.

***Vadose Zone***
The vadose zone is the area between the surface of the land and the surface of the water table in which the moisture content is less than the saturation point and the pressure is less than atmospheric. The openings (pore spaces) also typically contain air or other gases. See also Unsaturated Zone.

***Vapor***
Vapor is the gaseous phase of any substance that is liquid or solid at atmospheric temperatures and pressures. Steam is an example of a vapor.

***Volatile Organic Compound (VOC)***
A VOC is one of a group of carbon-containing compounds that evaporate readily at room temperature. Examples of VOCs include trichloroethane, trichloroethylene, and BTEX. These contaminants typically are generated from metal degreasing, printed circuit board cleaning, gasoline, and wood preserving processes.

***Volatilization***
Volatilization is the process of transfer of a chemical from the aqueous or liquid phase to the gas phase. Solubility, molecular weight, and vapor pressure of the liquid and the nature of the gas-liquid affect the rate of volatilization.

***Vinyl Chloride***
A volatile chlorinated organic chemical, produced as a breakdown product of trichloroethene. This compound is highly volatile, being a gas a room temperature.

***Wastewater***
Wastewater is spent or used water from an individual home, a community, a farm, or an industry that contains dissolved or suspended matter.

***Water Table***
A water table is the boundary between the saturated and unsaturated zones beneath the surface of the earth, i.e., the level of groundwater, and generally is the level to which water will rise in a well. *See also Aquifer and Groundwater*

**TABLE 1A**
**SENECA ARMY DEPOT**
**PROPOSED PLAN FOR SEAD-25/26**
**SEAD-25 Surface Soil Analysis Results**

| Parameter | NYSDEC TAGM [1] | Units | Source | Mean | Max. Hit | | No. of Hits>TAGM |
|---|---|---|---|---|---|---|---|
| Volatile Organics | | | | | | | |
| Acetone | 106.7 | UG/KG | NYSDEC GW Prot. | 5.6 | 5.0 | | 0 |
| Semivolatile Organics | | | | | | | |
| Benzo[a]anthracene | 224 OR MDL [2] | UG/KG | USEPA Health Based | 176.2 | 78.0 | [4] | 0 |
| Benzo[a]pyrene | 61 OR MDL [2] | UG/KG | USEPA Health Based | 161.1 | 87.0 | [4] | 2 |
| Benzo[b]fluoranthene | 1067 | UG/KG | NYSDEC GW Prot. | 162.4 | 86.0 | [4] | 0 |
| Benzo[ghi]perylene | 50000 | UG/KG | NYSDEC Rec. | 159.9 | 82.0 | [4] | 0 |
| Benzo[k]fluoranthene | 1067 | UG/KG | NYSDEC GW Prot. | 180.0 | 96.0 | [4] | 0 |
| Chrysene | 388 | UG/KG | NYSDEC GW Prot. | 129.9 | 110.0 | [4] | 0 |
| Dibenz[a,h]anthracene | 14 or MDL [2] | UG/KG | USEPA Health Based | 168.0 | 42.0 | [4] | 2 |
| Fluoranthene | 50000 | UG/KG | NYSDEC Rec. | 92.3 | 200.0 | | 0 |
| Indeno[1.2.3-cd]pyrene | 3104 | UG/KG | NYSDEC GW Prot. | 172.9 | 55.0 | [4] | 0 |
| Phenanthrene | 50000 | UG/KG | NYSDEC Rec. | 153.9 | 130.0 | [4] | 0 |
| Pyrene | 50000 | UG/KG | NYSDEC Rec. | 82.7 | 170.0 | | 0 |
| Pesticides/PCBs | | | | | | | |
| Endosulfan I | 873 | UG/KG | NYSDEC Rec. | 1.3 | 2.1 | | 0 |
| Endrin aldehyde | | UG/KG | | 2.9 | 8.4 | | 0 |
| Metals [3] | | | | | | | |
| Lead | 21.86 | MG/KG | Site Background | 33.0 | 44.4 | | 8 |
| Selenium | 2 | MG/KG | NYSDEC Rec. | 1.0 | 1.3 | | 0 |
| Thallium | 0.28 | MG/KG | Site Background | 0.9 | 1.8 | | 7 |

1. NYSDEC TAGM values are based on Technical and Administrative Guidance Memorandum HWR-94-4046 January 24, 1994. The TAGMs are TBCs and are for comparison purposes only. NYSDEC Groundwater Protection Standards are dependent on the organic content of surface soils at SEAD-25 which is 0.97%.
2. For semivolatile organic compounds the Minimum Detection Limit (MDL) is 330 ug/Kg.
3. According to the statistical analysis conducted in Section 6.2.3 of the RI report, lead, selenium, and thallium are the only elements that tend to be greater than the inorganic element concentrations that were detected in the same background media.
4. The mean value may be greater than the maximum value due to elevated detection limits that are sometimes exhibited in samples reported as non-detect. Since non-detect samples are given a value equal to one-half their detection limit when calculating the mean, the mean can be greater than the maximum detected value.

**TABLE 1B**
**SENECA ARMY DEPOT**
**PROPOSED PLAN FOR SEAD-25/26**
**SEAD-25 Surface and Subsurface Soil Analysis Results**

| Parameter | NYSDEC TAGM [1] | Units | Source | Mean | Max. Hit | | No. of Hits>TAGM |
|---|---|---|---|---|---|---|---|
| Volatile Organics | | | | | | | |
| 1,1,1-Trichloroethane | 592.8 | UG/KG | NYSDEC GW Prot. | 136.5 | 170 0 | | 0 |
| 1,2-Dichloroethene (total) | | UG/KG | | 125.0 | 310.0 | | 0 |
| 2-Butanone | 234 | UG/KG | NYSDEC GW Prot. | 6.4 | 10.0 | | 0 |
| Acetone | 85.8 | UG/KG | NYSDEC GW Prot. | 217.6 | 2800.0 | | 3 |
| Benzene | 46.8 | UG/KG | NYSDEC GW Prot. | 134.8 | 100.0 | [4] | 1 |
| Carbon disulfide | 2106 | UG/KG | NYSDEC GW Prot. | 5.6 | 2.0 | [4] | 0 |
| Chloroform | 234 | UG/KG | NYSDEC GW Prot. | 6.3 | 9.0 | | 0 |
| Ethyl benzene | 4290 | UG/KG | NYSDEC GW Prot. | 488.0 | 17000.0 | | 1 |
| Methylene chloride | 78 | UG/KG | NYSDEC GW Prot. | 116.4 | 390.0 | | 2 |
| Toluene | 1170 | UG/KG | NYSDEC GW Prot. | 183.3 | 4500.0 | | 1 |
| Total Xylenes | 936 | UG/KG | NYSDEC GW Prot. | 3828.9 | 130000.0 | | 5 |
| Trichloroethene | 546 | UG/KG | NYSDEC GW Prot. | 124.6 | 280.0 | | 0 |
| Semivolatile Organics | | | | | | | |
| 1,2,4-Trichlorobenzene | 2652 | UG/KG | NYSDEC GW Prot. | 796.0 | 1600.0 | | 0 |
| 1,4-Dichlorobenzene | 6630 | UG/KG | NYSDEC GW Prot | 798.4 | 1700 0 | | 0 |
| 2,4-Dinitrotoluene | | UG/KG | | 796.0 | 1600.0 | | 0 |
| 2-Chlorophenol | 624 | UG/KG | NYSDEC GW Prot. | 819.8 | 2600.0 | | 1 |
| 2-Methylnaphthalene | 28392 | UG/KG | NYSDEC GW Prot. | 925.3 | 8900.0 | | 0 |
| 4-Chloro-3-methylphenol | 187.2 | UG/KG | NYSDEC GW Prot. | 819.8 | 2600.0 | | 1 |
| 4-Nitrophenol | 78 | UG/KG | NYSDEC GW Prot. | 1578.2 | 1700 0 | | 1 |
| Acenaphthene | 50000 | UG/KG | NYSDEC Rec | 732.2 | 2000.0 | | 0 |
| Benzo[a]anthracene | 224 or MDL [2] | UG/KG | USEPA Health Based | 182 9 | 230.0 | | 1 |
| Benzo[a]pyrene | 61 or MDL [2] | UG/KG | USEPA Health Based | 183.9 | 87.0 | [4] | 2 |
| Benzo[b]fluoranthene | 858 | UG/KG | NYSDEC GW Prot. | 184.2 | 86.0 | [4] | 0 |
| Benzo[ghi]perylene | 50000 | UG/KG | NYSDEC Rec. | 176.3 | 120.0 | [4] | 0 |
| Benzo[k]fluoranthene | 858 | UG/KG | NYSDEC GW Prot. | 303.5 | 360 0 | | 0 |
| Bis(2-Ethylhexyl)phthalate | 50000 | UG/KG | NYSDEC Rec. | 557.2 | 750.0 | | 0 |
| Chrysene | 312 | UG/KG | NYSDEC GW Prot | 165.3 | 110.0 | [4] | 0 |
| Dibenz[a,h]anthracene | 14 or MDL [2] | UG/KG | USEPA Health Based | 260.1 | 360.0 | | 3 |
| Fluoranthene | 50000 | UG/KG | NYSDEC Rec | 155.6 | 200.0 | | 0 |
| Fluorene | 50000 | UG/KG | NYSDEC Rec | 456 6 | 1900 0 | | 0 |
| Indeno[1,2,3-cd]pyrene | 2496 | UG/KG | NYSDEC GW Prot. | 187.1 | 55.0 | [4] | 0 |
| N-Nitrosodiphenylamine | | UG/KG | | 673.6 | 1500 0 | | 0 |
| N-Nitrosodipropylamine | | UG/KG | | 803.2 | 1900.0 | | 0 |
| Naphthalene | 10140 | UG/KG | NYSDEC GW Prot. | 387.7 | 4300.0 | | 0 |
| Pentachlorophenol | 780 | UG/KG | NYSDEC GW Prot. | 1900.1 | 2300.0 | | 1 |
| Phenanthrene | 50000 | UG/KG | NYSDEC Rec. | 471.3 | 4600.0 | | 0 |
| Phenol | 23.4 | UG/KG | NYSDEC GW Prot. | 815 1 | 2400 0 | | 1 |
| Pyrene | 50000 | UG/KG | NYSDEC Rec | 591.2 | 2000.0 | | 0 |
| Pesticides/PCBs | | | | | | | |
| 4,4'-DDE | 2100 | UG/KG | | 2.0 | 4.8 | | 0 |
| 4,4'-DDT | 1950 | UG/KG | NYSDEC GW Prot. | 1.9 | 3.4 | | 0 |
| Alpha-Chlordane | | UG/KG | | 1.0 | 2.5 | | 0 |
| Aroclor-1254 | 1560 | UG/KG | NYSDEC GW Prot. | 21.9 | 130.0 | | 0 |
| Endosulfan I | 702 | UG/KG | NYSDEC GW Prot. | 1.1 | 2.5 | | 0 |
| Endrin | 78 | UG/KG | NYSDEC GW Prot. | 1.9 | 3.4 | | 0 |
| Endrin aldehyde | | UG/KG | | 2.1 | 8.4 | | 0 |
| Heptachlorepoxide | 15.6 | UG/KG | NYSDEC GW Prot. | 1.1 | 2.9 | | 0 |
| Metals [3] | | | | | | | |
| Lead | 21.86 | MG/KG | NYSDEC TAGM | 31.7 | 291.0 | | 14 |
| Selenium | 2 | MG/KG | NYSDEC TAGM | 0.7 | 2.3 | | 1 |
| Thallium | 0.28 | MG/KG | NYSDEC TAGM | 0.6 | 1.8 | | 20 |
| Herbicides | | | | | | | |
| Dicamba | | UG/KG | | 3.0 | 6.4 | | 0 |
| MCPP | | UG/KG | | 2875.0 | 4075 0 | | 0 |

1. NYSDEC TAGM values are based on Technical and Administrative Guidance Memorandum HWR-94-4046 January 24, 1994. The TAGMs are TBCs and are for comparison purposes only. NYSDEC Groundwater Protection Standards are dependent on the organic content of surface soils at SEAD-25 which is 0.78%.
2. For semivolatile organic compounds the Minimum Detection Limit (MDL) is 330 ug/Kg
3. According to the statistical analysis conducted in Section 6.2.3 of the RI report, lead, selenium, and thallium are the only elements that tend to be greater than the inorganic element concentrations that were detected in the same background media
4. The mean value may be greater than the maximum value due to elevated detection limits that are sometimes exhibited in samples reported as non-detect. Since non-detect samples are given a value equal to one-half their detection limit when calculating the mean, the mean can be greater than the maximum detected value.

**TABLE 1C**
**SENECA ARMY DEPOT**
**PROPOSED PLAN FOR SEAD-25/26**
**SEAD-25 Groundwater Analysis Results**

| Parameter | NYSDEC AWQS* | Units | Source | Mean | Max. Hit | | No. of Hits>AWQS |
|---|---|---|---|---|---|---|---|
| Volatile Organics | | | | | | | |
| 1,1,1-Trichloroethane | 5 | UG/L | NYSDEC AWQS-GA | 5.4 | 37.0 | | 3 |
| 1,1-Dichloroethane | 5 | UG/L | NYSDEC AWQS-GA | 2.2 | 8.0 | | 1 |
| 1,1-Dichloroethene | 5 | UG/L | NYSDEC AWQS-GA | 0.6 | 1.0 | | 0 |
| 1,2-Dichloroethene (total) | 5 | UG/L | NYSDEC AWQS-GA | 8.9 | 40.0 | | 4 |
| 2-Butanone (2) | 50 | UG/L | NYSDEC Guidance | 9.7 | 130.0 | | 1 |
| Benzene | 1 | UG/L | NYSDEC AWQS-GA | 79.2 | 1000.0 | | 7 |
| Bromoform (2) | 50 | UG/L | NYSDEC Guidance | 1.8 | 6.0 | | 0 |
| Chlorodibromomethane (2) | 50 | UG/L | NYSDEC Guidance | 1.3 | 3.0 | | 0 |
| Chloroform | 7 | UG/L | NYSDEC AWQS-GA | 4.5 | 17.0 | | 2 |
| Ethyl benzene | 5 | UG/L | NYSDEC AWQS-GA | 25.8 | 520.0 | | 5 |
| Tetrachloroethene | 5 | UG/L | NYSDEC AWQS-GA | 0.6 | 1.0 | | 0 |
| Toluene | 5 | UG/L | NYSDEC AWQS-GA | 71.9 | 1400.0 | | 6 |
| Total Xylenes (3) | 5 | UG/L | NYSDEC AWQS-GA | 231.0 | 3300.0 | | 7 |
| Trichloroethene | 5 | UG/L | NYSDEC AWQS-GA | 2.5 | 10.0 | | 2 |
| Semivolatile Organics | | | | | | | |
| 2,4-Dimethylphenol (4) | 1 | UG/L | NYSDEC AWQS-GA | 8.5 | 86.0 | | 3 |
| 2-Methylnaphthalene (5) | | UG/L | | 9.2 | 69.0 | | 0 |
| 2-Methylphenol (4) | 1 | UG/L | NYSDEC AWQS-GA | 15.5 | 23.0 | | 2 |
| 3,3`-Dichlorobenzidine (6) | 5 | UG/L | NYSDEC AWQS-GA | 8.9 | 10.0 | | 1 |
| 4-Methylphenol (4) | 1 | UG/L | NYSDEC AWQS-GA | 37.5 | 42.0 | | 2 |
| Fluorene (2) | 50 | UG/L | NYSDEC Guidance | 5.0 | 1.0 | (7) | 0 |
| Naphthalene (2) | 10 | UG/L | NYSDEC Guidance | 14.9 | 160.0 | | 3 |
| Phenanthrene (2) | 50 | UG/L | NYSDEC Guidance | 5.0 | 1.0 | (7) | 0 |
| Phenol (4) | 1 | UG/L | NYSDEC AWQS-GA | 10.0 | 56.0 | | 1 |
| Metals (2) | | | | | | | |
| Arsenic | 25 | UG/L | NYSDEC AWQS-GA | 2.0 | 8.9 | | 0 |
| Cadmium | 5 | UG/L | NYSDEC AWQS-GA | 0.2 | 0.4 | | 0 |
| Selenium | 10 | UG/L | NYSDEC AWQS-GA | 1.8 | 4.8 | | 0 |
| Thallium (2) | 0.5 | UG/L | NYSDEC Guidance | 1.9 | 4.7 | | 2 |

*NYSDEC AWQS for Class GA waters. From 6 NYCRR Parts 703.5, March 12, 1998.

**According to the statistical analysis conducted in Section 6.2.3 of the RI report, arsenic, cadmium, selenium, and thallium were found to be at concentrations in portions of SEAD-25 which exceed concentrations in portions of background areas.

2. NYS Guidance Value, "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations", TOGS 1.1.1, June 1998.
3. A standard of 5 ug/L has been assigned to each of the following xylene isomers (1,2-xylene, 1,3-xylene, and 1,4-xylene).
4. A standard of 1 ug/L applies to the sum of total phenolic compounds.
5. No standard or guidance value for groundwater is available for these substances as of June 1998.
6. Principal Organic Contaminant Standard applies (TOGS, June 1998).
7. The mean value may be greater than the maximum value due to elevated detection limits that are sometimes exhibited in samples reported as non-detect. Since non-detect samples are given a value equal to one-half their detection limit when calculating the mean, the mean can be greater than the maximum detected value.

**TABLE 2A**
**SENECA ARMY DEPOT**
**PROPOSED PLAN FOR SEAD-25/26**
**SEAD-26 Surface Soil Analysis Results**

| Parameter | NYSDEC TAGM [1] | Units | Source | Mean | Max. Hit | | No. of Hits>TAGM |
|---|---|---|---|---|---|---|---|
| Volatile Organics | | | | | | | |
| 1,1-Dichloroethene | 388 | UG/KG | NYSDEC GW Prot. | 5.6 | 2.0 | [4] | 0 |
| Acetone | 106.7 | UG/KG | NYSDEC GW Prot. | 7.0 | 31.0 | | 0 |
| Benzene | 58.2 | UG/KG | NYSDEC GW Prot. | 5.6 | 3.0 | [4] | 0 |
| Carbon disulfide | 2619 | UG/KG | NYSDEC GW Prot. | 5.6 | 2.0 | [4] | 0 |
| Chlorobenzene | 1649 | UG/KG | NYSDEC GW Prot. | 5.6 | 4.0 | [4] | 0 |
| Chloroform | 291 | UG/KG | NYSDEC GW Prot. | 5.6 | 5.8 | | 0 |
| Methylene chloride | 97 | UG/KG | NYSDEC GW Prot. | 5.8 | 11.0 | | 0 |
| Toluene | 1455 | UG/KG | NYSDEC GW Prot. | 5.5 | 4.0 | [4] | 0 |
| Total Xylenes | 1164 | UG/KG | NYSDEC GW Prot. | 5.6 | 7.0 | | 0 |
| Trichloroethene | 679 | UG/KG | NYSDEC GW Prot. | 5.6 | 4.0 | [4] | 0 |
| Semivolatile Organics | | | | | | | |
| 1,2,4-Trichlorobenzene | 3298 | UG/KG | NYSDEC GW Prot. | 375.9 | 430.0 | | 0 |
| 2,4,5-Trichlorophenol | 97 | UG/KG | NYSDEC GW Prot. | 747.6 | 850.0 | | 1 |
| 2,4-Dinitrophenol | 194 | UG/KG | NYSDEC GW Prot. | 816.4 | 960.0 | | 9 |
| 2-Methylnaphthalene | 35308 | UG/KG | NYSDEC GW Prot. | 775.6 | 590.0 | [4] | 0 |
| 2-Nitroaniline | 417.1 | UG/KG | NYSDEC GW Prot. | 1853.9 | 4400.0 | | 16 |
| 2-Nitrophenol | 320.1 | UG/KG | NYSDEC GW Prot. | 357.1 | 430.0 | | 15 |
| 3,3`-Dichlorobenzidine | | UG/KG | | 932.6 | 1800.0 | | 0 |
| 3-Nitroaniline | 485 | UG/KG | NYSDEC GW Prot. | 1756.4 | 5900.0 | | 2 |
| 4,6-Dinitro-2-methylphenol | | UG/KG | | 747.5 | 840.0 | | 0 |
| 4-Chloro-3-methylphenol | 232.8 | UG/KG | NYSDEC GW Prot. | 369.6 | 400.0 | | 4 |
| 4-Chloroaniline | 213.4 | UG/KG | NYSDEC GW Prot. | 322.1 | 390.0 | | 5 |
| 4-Nitroaniline | | UG/KG | | 1712.2 | 1800.0 | | 0 |
| Acenaphthene | 50000 | UG/KG | NYSDEC Rec. | 844.6 | 990.0 | | 0 |
| Anthracene | 50000 | UG/KG | NYSDEC Rec. | 879.5 | 1600.0 | | 0 |
| Benzo[a]anthracene | 24 or MDL [2] | UG/KG | USEPA Health Based | 1157.0 | 4700.0 | | 18 |
| Benzo[a]pyrene | 61 or MDL [2] | UG/KG | USEPA Health Based | 1114.6 | 4400.0 | | 30 |
| Benzo[b]fluoranthene | 1067 | UG/KG | NYSDEC GW Prot. | 1233.2 | 5000.0 | | 8 |
| Benzo[ghi]perylene | 50000 | UG/KG | NYSDEC Rec. | 958.1 | 2800.0 | | 0 |
| Benzo[k]fluoranthene | 1067 | UG/KG | NYSDEC GW Prot. | 1066.2 | 4200.0 | | 5 |
| Bis(2-Ethylhexyl)phthalate | 50000 | UG/KG | NYSDEC Rec. | 304.2 | 400.0 | | 0 |
| Butylbenzylphthalate | 50000 | UG/KG | NYSDEC Rec. | 877.3 | 730.0 | [4] | 0 |
| Carbazole | | UG/KG | | 880.0 | 1400.0 | | 0 |
| Chrysene | 388 | UG/KG | NYSDEC GW Prot. | 1213.3 | 4900.0 | | 15 |
| Di-n-butylphthalate | 7857 | UG/KG | NYSDEC GW Prot. | 604.7 | 6200.0 | | 0 |
| Dibenz[a,h]anthracene | 14 or MDL [2] | UG/KG | USEPA Health Based | 835.2 | 750.0 | [4] | 16 |
| Dibenzofuran | 6014 | UG/KG | NYSDEC GW Prot. | 462.1 | 480.0 | | 0 |
| Fluoranthene | 50000 | UG/KG | NYSDEC Rec. | 1893.8 | 11000.0 | | 0 |
| Fluorene | 50000 | UG/KG | NYSDEC Rec. | 833.8 | 960.0 | | 0 |
| Hexachlorobutadiene | | UG/KG | | 375.8 | 430.0 | | 0 |
| Hexachlorocyclopentadiene | | UG/KG | | 379.2 | 430.0 | | 0 |
| Indeno[1,2,3-cd]pyrene | 3104 | UG/KG | NYSDEC Rec. | 959.1 | 2800.0 | | 0 |
| Isophorone | 4268 | UG/KG | NYSDEC Rec. | 357.1 | 430.0 | | 0 |
| Naphthalene | 1261 | UG/KG | NYSDEC GW Prot. | 185.0 | 36.0 | [4] | 0 |
| Nitrobenzene | 194 | UG/KG | NYSDEC GW Prot. | 332.8 | 400.0 | | 8 |
| Pentachlorophenol | 970 | UG/KG | NYSDEC GW Prot. | 871.4 | 960.0 | | 0 |

**TABLE 2A**
**SENECA ARMY DEPOT**
**PROPOSED PLAN FOR SEAD-25/26**
**SEAD-26 Surface Soil Analysis Results**

| Parameter | NYSDEC TAGM [1] | Units | Source | Mean | Max. Hit | No. of Hits>TAGM |
|---|---|---|---|---|---|---|
| Phenanthrene | 50000 | UG/KG | NYSDEC Rec. | 1395.3 | 8900.0 | 0 |
| Pyrene | 50000 | UG/KG | NYSDEC Rec. | 1116.0 | 8500.0 | 0 |
| Pesticides/PCBs | | | | | | |
| 4,4`-DDD | 2900 | UG/KG | USEPA Health Based | 2.9 | 22.0 | 0 |
| 4,4`-DDE | 2100 | UG/KG | USEPA Health Based | 7.3 | 140.0 | 0 |
| 4,4`-DDT | 2100 | UG/KG | USEPA Health Based | 5.3 | 66.0 | 0 |
| Alpha-Chlordane | | UG/KG | | 1.2 | 1.6 | 0 |
| Beta-BHC | 194 | UG/KG | NYSDEC GW Prot. | 1.2 | 1.4 | 0 |
| Pesticides/PCBs (cont) | | | | | | |
| Delta-BHC | 291 | UG/KG | NYSDEC GW Prot. | 1.1 | 1.2 | 0 |
| Dieldrin | 44 | UG/KG | USEPA Health Based | 2.3 | 4.4 | 0 |
| Endosulfan I | 873 | UG/KG | NYSDEC GW Prot. | 1.3 | 5.6 | 0 |
| Endosulfan II | 873 | UG/KG | NYSDEC GW Prot. | 4.9 | 60.0 | 0 |
| Endosulfan sulfate | 970 | UG/KG | NYSDEC GW Prot. | 3.7 | 23.0 | 0 |
| Endrin | 97 | UG/KG | NYSDEC GW Prot. | 2.4 | 8.0 | 0 |
| Endrin aldehyde | | UG/KG | | 3.7 | 23.0 | 0 |
| Endrin ketone | | UG/KG | | 2.6 | 13.0 | 0 |
| Gamma-Chlordane | 540 | UG/KG | USEPA Health Based | 1.3 | 7.8 | 0 |
| Heptachlor | 97 | UG/KG | NYSDEC GW Prot. | 1.3 | 2.9 | 0 |
| Heptachlorepoxide | 19.4 | UG/KG | NYSDEC GW Prot. | 1.3 | 2.8 | 0 |
| Methoxychlor | | UG/KG | | 11.3 | 21.0 | 0 |
| Nitroaromatics | | | | | | |
| 2,4-Dinitrotoluene | | UG/KG | | 148.5 | 410.0 | 0 |
| 4-amino-2,6-Dinitrotoluene | | UG/KG | | 68.3 | 97.5 | 0 |
| HMX | | UG/KG | | 76.2 | 120.0 | 0 |
| Metals [3] | | | | | | |
| Arsenic | 7.5 | MG/KG | NYSDEC Rec. | 6.3 | 12.2 | 14 |
| Lead | 21.86 | MG/KG | Site Background | 28.6 | 522.0 | 15 |
| Selenium | 2 | MG/KG | NYSDEC Rec. | 0.4 | 0.9 | 0 |
| Thallium | 0.28 | MG/KG | Site Background | 0.6 | 1.3 | 31 |
| Zinc | 82.5 | MG/KG | Site Background | 99.9 | 503.0 | 34 |
| Herbicides | | | | | | |
| 2,4,5-T | 1843 | UG/KG | NYSDEC GW Prot. | 26.1 | 220.0 | 0 |
| 2,4-D | 485 | UG/KG | NYSDEC GW Prot. | 50.7 | 260.0 | 0 |

1. NYSDEC TAGM values are based on Technical and Administrative Guidance Memorandum HWR-94-4046 January 24, 1994. The TAGMs are TBCs and are for comparison purposes only.
   NYSDEC Groundwater Protection Standards are dependent on the organic content of surface soils at SEAD-26 which is 0.97%.
2. For semivolatile organic compounds the Minimum Detection Limit (MDL) is 330 ug/Kg.
3. According to the statistical analysis conducted in Section 7.2.3 of the RI report, arsenic, lead, selenium, thallium, and zinc are the only elements that tend to be greater than the inorganic element concentrations that were detected in the same background media.
4. The mean value may be greater than the maximum value due to elevated detection limits that are sometimes exhibited in samples reported as non-detect. Since non-detect samples are given a value equal to one-half their detection limit when calculating the mean, the mean can be greater than the maximum detected value.

**TABLE 2B**
**SENECA ARMY DEPOT**
**PROPOSED PLAN FOR SEAD-25/26**
**SEAD-26 Surface and Subsurface Soil Analysis Results**

| Parameter | NYSDEC TAGM [1] | Units | Source | Mean | Max. Hit | | No. of Hits>TAGM |
|---|---|---|---|---|---|---|---|
| Volatile Organics | | | | | | | |
| 1,1-Dichloroethene | 124 | UG/KG | NYSDEC GW Prot. | 5.7 | 2.0 | [4] | 0 |
| 2-Butanone | 93 | UG/KG | NYSDEC GW Prot. | 28.1 | 19.0 | [4] | 0 |
| Acetone | 34.1 | UG/KG | NYSDEC GW Prot. | 33.2 | 120.0 | | 2 |
| Benzene | 18.6 | UG/KG | NYSDEC GW Prot. | 5.7 | 3.0 | [4] | 0 |
| Carbon disulfide | 837 | UG/KG | NYSDEC GW Prot. | 5.6 | 2.0 | [4] | 0 |
| Chlorobenzene | 527 | UG/KG | NYSDEC GW Prot. | 5.7 | 4.0 | [4] | 0 |
| Chloroform | 93 | UG/KG | NYSDEC GW Prot. | 5.7 | 5.8 | | 0 |
| Ethyl benzene | 1705 | UG/KG | NYSDEC GW Prot. | 24.4 | 360.0 | | 0 |
| Methylene chloride | 31 | UG/KG | NYSDEC GW Prot. | 31.8 | 365.0 | | 1 |
| Toluene | 465 | UG/KG | NYSDEC GW Prot. | 5.6 | 4.3 | [4] | 0 |
| Total Xylenes | 372 | UG/KG | NYSDEC GW Prot. | 23.8 | 310.0 | | 0 |
| Trichloroethene | 217 | UG/KG | NYSDEC GW Prot. | 5.7 | 4.0 | [4] | 0 |
| Semivolatile Organics | | | | | | | |
| 1,2,4-Trichlorobenzene | 1054 | UG/KG | NYSDEC GW Prot. | 452.8 | 430.0 | [4] | 0 |
| 2,4,5-Trichlorophenol | 31 | UG/KG | NYSDEC GW Prot. | 849.8 | 930.0 | | 3 |
| 2,4-Dinitrophenol | 62 | UG/KG | NYSDEC GW Prot. | 879.8 | 960.0 | | 9 |
| 2-Methylnaphthalene | 11284 | UG/KG | NYSDEC GW Prot. | 688.0 | 5300.0 | | 0 |
| 2-Nitroaniline | 133.3 | UG/KG | NYSDEC GW Prot. | 1471.3 | 4400.0 | | 22 |
| 2-Nitrophenol | 102.3 | UG/KG | NYSDEC GW Prot. | 378.8 | 430.0 | | 17 |
| 3,3`-Dichlorobenzidine | | UG/KG | | 702.4 | 1800.0 | | 0 |
| 3-Nitroaniline | 155 | UG/KG | NYSDEC GW Prot. | 1367.0 | 5900.0 | | 2 |
| 4,6-Dinitro-2-methylphenol | | UG/KG | | 850.2 | 950.0 | | 0 |
| 4-Chloro-3-methylphenol | 74.4 | UG/KG | NYSDEC GW Prot. | 352.9 | 400.0 | | 4 |
| 4-Chloroaniline | 68.2 | UG/KG | NYSDEC GW Prot. | 354.7 | 390.0 | | 5 |
| 4-Nitroaniline | 309.69 | UG/KG | NYSDEC GW Prot. | 1340.8 | 1800.0 | | 1 |
| Acenaphthene | 27900 | UG/KG | NYSDEC GW Prot. | 614.3 | 990.0 | | 0 |
| Anthracene | 50000 | UG/KG | NYSDEC Rec. | 650.0 | 1600.0 | | 0 |
| Benzo[a]anthracene | 224 or MDL [2] | UG/KG | USEPA Health Based | 832.5 | 4700.0 | | 20 |
| Benzo[a]pyrene | 61 or MDL [2] | UG/KG | USEPA Health Based | 799.2 | 4400.0 | | 37 |
| Benzo[b]fluoranthene | 341 | UG/KG | NYSDEC GW Prot. | 880.0 | 5000.0 | | 18 |
| Benzo[ghi]perylene | 50000 | UG/KG | NYSDEC Rec. | 708.4 | 2800.0 | | 0 |
| Benzo[k]fluoranthene | 341 | UG/KG | NYSDEC GW Prot. | 769.2 | 4200.0 | | 17 |
| Bis(2-Ethylhexyl)phthalate | 50000 | UG/KG | NYSDEC Rec. | 683.7 | 1300.0 | | 0 |
| Butylbenzylphthalate | 37820 | UG/KG | NYSDEC GW Prot. | 658.5 | 730.0 | | 0 |
| Carbazole | | UG/KG | | 650.2 | 1400.0 | | 0 |
| Chrysene | 124 | UG/KG | NYSDEC GW Prot. | 873.0 | 4900.0 | | 35 |
| Di-n-butylphthalate | 2511 | UG/KG | NYSDEC GW Prot. | 492.8 | 6200.0 | | 1 |
| Dibenz[a,h]anthracene | 14 or MDL [2] | UG/KG | USEPA Health Based | 625.7 | 1100.0 | | 20 |
| Dibenzofuran | 1922 | UG/KG | NYSDEC GW Prot. | 604.0 | 520.0 | [4] | 0 |
| Fluoranthene | 50000 | UG/KG | NYSDEC Rec. | 1354.8 | 13000.0 | | 0 |
| Fluorene | 50000 | UG/KG | NYSDEC Rec. | 616.3 | 1200.0 | | 0 |
| Hexachlorobutadiene | | UG/KG | | 456.8 | 430.0 | [4] | 0 |
| Hexachlorocyclopentadiene | | UG/KG | | 366.4 | 430.0 | | 0 |
| Indeno[1,2,3-cd]pyrene | 992 | UG/KG | NYSDEC GW Prot. | 720.9 | 2800.0 | | 6 |
| Isophorone | 1364 | UG/KG | NYSDEC GW Prot. | 378.8 | 430.0 | | 0 |
| Naphthalene | 4030 | UG/KG | NYSDEC GW Prot. | 641.8 | 850.0 | | 0 |
| Nitrobenzene | 62 | UG/KG | NYSDEC GW Prot. | 360.8 | 400.0 | | 8 |
| Pentachlorophenol | 310 | UG/KG | NYSDEC GW Prot. | 840.9 | 960.0 | | 1 |

**TABLE 2B**
**SENECA ARMY DEPOT**
**PROPOSED PLAN FOR SEAD-25/26**
**SEAD-26 Surface and Subsurface Soil Analysis Results**

| Parameter | NYSDEC TAGM [1] | Units | Source | Mean | Max. Hit | No. of Hits>TAGM |
|---|---|---|---|---|---|---|
| Phenanthrene | 50000 | UG/KG | NYSDEC Rec. | 1032.4 | 8900.0 | 0 |
| Pyrene | 50000 | UG/KG | NYSDEC Rec. | 834.3 | 8500.0 | 0 |
| Pesticides/PCBs | | | | | | |
| 4,4`-DDD | 2900 | UG/KG | USEPA Health Based | 2.5 | 22.0 | 0 |
| 4,4`-DDE | 1364 | UG/KG | NYSDEC GW Prot. | 5.2 | 140.0 | 0 |
| 4,4`-DDT | 775 | UG/KG | NYSDEC GW Prot. | 3.9 | 66.0 | 0 |
| Pesticides/PCBs (cont) | | | | | | |
| Alpha-Chlordane | | UG/KG | | 1.1 | 1.6 | 0 |
| Beta-BHC | 62 | UG/KG | NYSDEC GW Prot. | 1.1 | 1.4 | 0 |
| Delta-BHC | 93 | UG/KG | NYSDEC GW Prot. | 1.1 | 1.2 | 0 |
| Dieldrin | 44 | UG/KG | USEPA Health Based | 2.1 | 4.4 | 0 |
| Endosulfan I | 279 | UG/KG | NYSDEC GW Prot. | 1.2 | 5.6 | 0 |
| Endosulfan II | 279 | UG/KG | NYSDEC GW Prot. | 3.7 | 60.0 | 0 |
| Endosulfan sulfate | 310 | UG/KG | NYSDEC GW Prot. | 3.0 | 23.0 | 0 |
| Endrin | 31 | UG/KG | NYSDEC GW Prot. | 2.2 | 8.0 | 0 |
| Endrin aldehyde | | UG/KG | | 3.1 | 23.0 | 0 |
| Endrin ketone | | UG/KG | | 2.3 | 13.0 | 0 |
| Gamma-Chlordane | 540 | UG/KG | USEPA Health Based | 1.2 | 7.8 | 0 |
| Heptachlor | 31 | UG/KG | NYSDEC GW Prot. | 1.1 | 2.9 | 0 |
| Heptachlor epoxide | 6.2 | UG/KG | NYSDEC GW Prot. | 1.1 | 2.8 | 0 |
| Methoxychlor | | UG/KG | | 10.7 | 21.0 | 0 |
| Nitroaromatics | | | | | | |
| 2,4-Dinitrotoluene | | UG/KG | | 124.6 | 410.0 | 0 |
| 4-amino-2,6-Dinitrotoluene | | UG/KG | | 67.3 | 97.5 | 0 |
| HMX | | UG/KG | | 73.0 | 120.0 | 0 |
| Metals [3] | | | | | | |
| Arsenic | 7.5 | MG/KG | NYSDEC Rec. | 6.7 | 13.0 | 30 |
| Lead | 21.86 | MG/KG | Site Background | 31.1 | 522.0 | 20 |
| Selenium | 2 | MG/KG | NYSDEC Rec. | 0.4 | 1.1 | 0 |
| Thallium | 0.28 | MG/KG | Site Background | 0.5 | 1.4 | 44 |
| Zinc | 82.5 | MG/KG | Site Background | 96.9 | 503.0 | 52 |
| Herbicides | | | | | | |
| 2,4,5-T | 589 | UG/KG | NYSEC GW Prot. | 9.9 | 220.0 | 0 |
| 2,4-D | 155 | UG/KG | NYSDEC GW Prot. | 35.7 | 260.0 | 1 |
| Dicamba | | UG/KG | | 3.3 | 9.1 | 0 |
| MCPA | | UG/KG | | 4172.0 | 29000.0 | 0 |
| MCPP | | UG/KG | | 3487.1 | 13000.0 | 0 |

1. NYSDEC TAGM values are based on Technical and Administrative Guidance Memorandum HWR-94-4046 January 24, 1994. The TAGMs are TBCs and are for comparison purposes only. NYSDEC Groundwater Protection Standards are dependent on the organic content of surface soils at SEAD-26 which is 0.31%.
2. For semivolatile organic compounds the Minimum Detection Limit (MDL) is 330 ug/Kg.
3. According to the statistical analysis conducted in Section 7.2.3 of the RI report, arsenic, lead, selenium, thallium, and zinc are the only elements that tend to be greater than the inorganic element concentrations that were detected in the same background media.
4. The mean value may be greater than the maximum value due to elevated detection limits that are sometimes exhibited in samples reported as non-detect. Since non-detect samples are given a value equal to one-half their detection limit when calculating the mean, the mean can be greater than the maximum detected value

**TABLE 2C**
**SENECA ARMY DEPOT**
**PROPOSED PLAN FOR SEAD-25/26**
**SEAD-26 Groundwater Analysis Results**

| Parameter | NYSDEC AWQS [1] | Units | Source | Mean | Max. Hit | | No. of Hits>AWQS |
|---|---|---|---|---|---|---|---|
| Volatile Organics | | | | | | | |
| 1,2,4-Trimethylbenzene | 5 | UG/L | NYSDEC AWQS-GA | 1.6 | 17.0 | | 2 |
| 1,3,5-Trimethylbenzene | 5 | UG/L | NYSDEC AWQS-GA | 0.8 | 7.0 | | 1 |
| Acetone[2] | 50 | UG/L | NYSDEC Guidance | 2.8 | 3.8 | | 0 |
| Benzene | 1 | UG/L | NYSDEC AWQS-GA | 0.8 | 1.5 | | 1 |
| Ethyl benzene | 5 | UG/L | NYSDEC AWQS-GA | 1.4 | 8.0 | | 2 |
| Isopropylbenzene | 5 | UG/L | NYSDEC AWQS-GA | 0.7 | 5.0 | | 1 |
| Methyl chloride | 5 | UG/L | NYSDEC AWQS-GA | 0.5 | 0.7 | | 0 |
| Naphthalene [2] | 10 | UG/L | NYSDEC Guidance | 1.5 | 15.0 | | 2 |
| Toluene | 5 | UG/L | NYSDEC AWQS-GA | 0.3 | 0.3 | | 0 |
| Total Xylenes [3] | 5 | UG/L | NYSDEC AWQS-GA | 1.1 | 5.0 | | 1 |
| n-Butylbenzene | 5 | UG/L | NYSDEC AWQS-GA | 0.4 | 3.0 | | 0 |
| n-Propylbenzene | 5 | UG/L | NYSDEC AWQS-GA | 0.7 | 6.0 | | 1 |
| p-Isopropyltoluene | 5 | UG/L | NYSDEC AWQS-GA | 0.7 | 6.0 | | 1 |
| sec-Butylbenzene | 5 | UG/L | NYSDEC AWQS-GA | 0.6 | 4.0 | | 0 |
| tert-Butylbenzene | 5 | UG/L | NYSDEC AWQS-GA | 0.3 | 0.6 | | 0 |
| Semivolatile Organics | | | | | | | |
| 2-Methylnaphthalene [5] | | UG/L | | 5.4 | 8.5 | | 0 |
| Acenaphthene [2] | 20 | UG/L | NYSDEC Guidance | 5.1 | 3.5 | [4] | 0 |
| Dibenzofuran [5] | | UG/L | | 5.0 | 3.0 | [4] | 0 |
| Diethyl phthalate [2] | 50 | UG/L | NYSDEC Guidance | 5.0 | 0.5 | [4] | 0 |
| Fluorene [2] | 50 | UG/L | NYSDEC Guidance | 5.2 | 5.0 | [4] | 0 |
| Naphthalene [2] | 10 | UG/L | NYSDEC Guidance | 5.8 | 12.5 | | 1 |
| Phenanthrene [2] | 50 | UG/L | NYSDEC Guidance | 5.0 | 3.0 | [4] | 0 |
| Metals [6] | | | | | | | |
| Potassium [5] | | UG/L | | 29452.0 | 108000.0 | | 0 |

1. YSDEC AWQS for Class GA waters from 6 NYCRR Parts 703.5 March 12, 1998.
2. NYS Guidance Value, "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations", TOGS 1.1.1, June 1998.
3. A standard of 5 ug/L has been assigned to each of the following xylene isomers (1,2-xylene, 1,3-xylene, and 1,4-xy
5. No standard or guidance value for groundwater is available for these substances as of June 1998.
4. The mean value may be greater than the maximum value due to elevated detection limits that are sometimes exhibited in samples reported as non-detect. Since non-detect samples are given a value equal to one-half their detection limit when calculating the mean, the mean can be greater than the maximum detected value.
6. According to the statistical analysis conducted in Section 7.2.3 of the RI report, only potassium was found to be at concentrations in portions of SEAD-26 which exceed concentrations in portions of background areas.

# Table 3A
# SENECA ARMY DEPOT ACTIVITY
# PROPOSED PLAN FOR SEAD-25/26
## SEAD-25 Site-Specific Cleanup Goals for Soil, Sediment, and Groundwater

| | Soil NYSDEC TAGM[1] ug/kg | Groundwater NYSDEC Class GA Standard[2] ug/L | Sediment NYSDEC TAGM[1] ug/kg |
|---|---|---|---|
| **Volatile Organic Compounds** | | | |
| 1,1,1-Trichloroethane | 800 | 5 | NA |
| 1,1-Dichloroethane | 200 | 5 | NA |
| 1,2-Dichloroethene (total) | | 5 | NA |
| Benzene | 60 | 1 | NA |
| Chloroform | 300 | 7 | NA |
| Ethyl benzene | 5,500 | 5 | NA |
| Toluene | 1,500 | 5 | NA |
| Trichloroethene | 700 | 5 | NA |
| Xylene (total) | 1200 | 5 | NA |
| **Semivolatile Organic Compounds** | | | |
| Benzo(a)anthracene | NA | NA | 224 or MDL[4] |
| Benzo(a)pyrene | NA | NA | 61 or MDL[4] |
| Benzo(b)fluoranthene | NA | NA | 1100 |
| 2-Methylnaphthalene | 36,400 | NA | NA |
| 2-Methylphenol[3] | NA | 1 | NA |
| 2,4-Dimethylphenol[3] | NA | 1 | NA |
| 3',3'-Dichlorobenzidine | NA | 5 | NA |
| 4-Methylphenol[3] | NA | 1 | NA |
| Naphthalene | 13,000 | NA | NA |
| Phenol[3] | 30 | 1 | NA |

1. NYSDEC TAGM values from Technical and Administrative Guidance Memorandum HWR-92-4046, January 24, 1994 (Tables 1, 2, and 3).
2. NYSDEC AWQS for Class GA waters. From 6 NYCRR Parts 701-705. TOGS 1.1.1, June 1998.
3. For groundwater, a standard of 1 µg/L applies to the sum of total phenolic compounds.
4. For semivolatile organic compounds the Minimum Detection Limit (MDL) is 330 ug/Kg.

NA indicates that the compound is not a COC in that media.

**Table 3B**

**SENECA ARMY DEPOT ACTIVITY**

**PROPOSED PLAN FOR SEAD-25/26**

**SEAD-26 Site-Specific Cleanup Goals for Groundwater**

| | Groundwater NYSDEC Class GA Standard[1] ug/L |
|---|---|
| **Volatile Organic Compounds** | |
| Benzene | 1 |
| Ethyl benzene | 5 |
| Xylene (total) | 5 |
| 1,2,4-Trimethylbenzene[2] | 5 |
| 1,3,5-Trimethylbenzene[2] | 5 |
| n-Propylbenzene[2] | 5 |
| p-Isopropyltoluene[2] | 5 |

1. NYSDEC AWQS for Class GA waters. From 6 NYCRR Parts 701-705. TOGS 1.1.1, June 1998
2. Principal organic contaminant standard applies (TOGS 1.1.1, June 1998).

**Table 4**
**Summary of Detailed Evaluation of Alternatives**
**Proposed Plan for SEAD-25**
**Seneca Army Depot Activity**

| | Industrial | | | | | | | Residential | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Criteria** | **RA25-1 No Action** | **RA25-2 Institutional Controls and Natural Attenuation of Plume** | **RA25-3 Bioventing of Soil and Air Sparging of Plume** | **RA25-3A Bioventing of Soil and Natural Attenuation of Plume** | **RA25-4 Source Removal, Off-site Disposal, and Long-Term Monitoring of Plume** | **RA25-5 Source Removal, Off-site Disposal, and Air Stripping of Plume** | **RA25-6 Source Removal, Off-site Disposal, and Air Sparging of Plume** | **RA25-3R Bioventing of Soil, Air Sparging of Plume and Sediment Removal (1 ditch)** | **RA25-3AR Bioventing of Soil, Natural Attenuation of Plume and Sediment Removal (1 ditch)** | **RA25-4R Source Removal, Off-site Disposal, Long-term Monitoring of Plume, and Sediment (1ditch)** |
| **Protectiveness of Human Health and the Environment** | | | | | | | | | | |
| Human Health Protection ( EPA target range $1x10^{-4}$ to $1x10^{-6}$ for carcinogenic risks and HI < 1 0 for noncarcinogenic risk) | Sum of risks... | Sum of risks remaining after implementation of alternative are... | Sum of risks remaining after implementation of alternative are | Sum of risks remaining after implementation of alternative are | Sum of risks remaining after implementation of alternative are | Sum of risks remaining after implementation of alternative are.. | Sum of risks remaining after implementation of alternative are .. | Sum of risks remaining after implementation of alternative are... | Summary of risks remaining after implementation of alternative are .. | Summary of risks remaining after implementation of alternative are... |
| carcinogenic risk (1)(3) | $3x10^{-3}$, $3x10^{-4}$, $4x10^{-6}$ | $3x10^{-3}$, $3x10^{-4(2)}$, $4x10^{-6}$ | $3x10^{-3}$, $3x10^{-4(2)}$, $8x10^{-7}$ | $3x10^{-3}$, $3x10^{-4(2)}$, $8x10^{-7}$ | $3x10^{-3}$, $3x10^{-4(2)}$, $8x10^{-7}$ | $3x10^{-3}$, $3x10^{-4(2)}$, $8x10^{-7}$ | $3x10^{-3}$, $3x10^{-4(2)}$, $8x10^{-7}$ | $3x10^{-3}$, $8x10^{-5}$, $8x10^{-7}$ | $3x10^{-3}$, $8x10^{-5}$, $8x10^{-7}$ | $3x10^{-3}$, $8x10^{-5}$, $8x10^{-7}$ |
| noncarcinogenic risk - HI (1)(3) | 0.001, 10 (child) and 5 (adult), 4 | 0.001, 1 (child) and 0.2 (adult), 4 | 0.001, 1 (child) and 0 2 (adult), 0.3 | 0 001, 1 (child) and 0 2 (adult), 0.3 | 0 001, 1 (child) and 0 2 (adult), 0 3 | 0.001, 1 (child) and 0 2 (adult), 0.3 | 0.001, 1 (child) and 0.2 (adult), 0.3 | 0.001, 0.7 (child) and 0.2 (adult), 0.3 | 0.001, 0.7 (child) and 0.2 (adult), 0.3 | 0 001, 0.7 (child) and 0.2 (adult), 0.3 |
| Exposure Pathways | Not Protective - risks mainly from future residential exposure to groundwater and future construction worker inhalation of volatile organics in ambient air | Not Protective - risk from future construction worker inhalation of volatile organics. Fencing prevents exposure to surface soils and natural attenuation eliminates exposure to groundwater | Protective: risks are acceptable, soil exposure eliminated through bioventing and groundwater exposure is eliminated via sparging | Protective: risks are acceptable, soil exposure eliminated through bioventing and groundwater exposure is eliminated via natural attenuation | Protective: risks are acceptable, soil exposure eliminated through excavation of source area and off-site disposal and groundwater exposure is eliminated by treatment of recovered water with an air stripper and via biodegradation | Protective: risks are acceptable, soil exposure eliminated through excavation of source area and off-site disposal and groundwater exposure is eliminated via air stripping | Protective: risks are acceptable, soil exposure eliminated through excavation of source area and off-site disposal and groundwater exposure is eliminated via air sparging. | Protective - risks are acceptable; soil exposure eliminated through bioventing and groundwater exposure is eliminated via sparging; sediment removal from one ditch has acceptable risk | Protective: risks are acceptable, soil exposure eliminated through bioventing and groundwater exposure is eliminated via natural attenuation;sediment removal from one ditch has acceptable risk | Protective: risks are acceptable, soil exposure eliminated through excavation of source area and off-site disposal and groundwater exposure is eliminated by treatment of recovered water with an air stripper and via biodegradation; sediment removal from one ditch has acceptable |
| Protection of Ecological Receptors | Protective - depth to groundwater prevents ecological exposure; current ecological risk is negligible | Protective - depth to groundwater prevents ecological exposure; current ecological risk is negligible | Protective: Depth to groundwater prevents ecological exposure; current ecological risk is negligible | Protective: Depth to groundwater prevents ecological exposure; current ecological risk is negligible | Protective: Depth to groundwater prevents ecological exposure; current ecological risk is negligible | Protective: Depth to groundwater prevents ecological exposure; current ecological risk is negligible | Protective: Depth to groundwater prevents ecological exposure; current ecological risk is negligible | Protective: Depth to groundwater prevents ecological exposure; current ecological risk is negligible | Protective: Depth to groundwater prevents ecological exposure; current ecological risk is negligible | Protective: Depth to groundwater prevents ecological exposure, current ecological risk is negligible |
| **Compliance with ARARs** | Not Compliant with ARARS | Compliant with ARARs, but in groundwater will require a long period of time to meet remediation standards | Will Comply with all ARARs | Will Comply with all ARARs | Will Comply with all ARARs | Will Comply with all ARARs | Will Comply with all ARARs | Will Comply with all ARARs | Will Comply with all ARARs | Will comply with all ARARs |

**Table 4**
**Summary of Detailed Evaluation of Alternatives**
**Proposed Plan for SEAD-25**
**Seneca Army Depot Activity**

| | Industrial | | | | | | | Residential | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Criteria** | **RA25-1 No Action** | **RA25-2 Institutional Controls and Natural Attenuation of Plume** | **RA25-3 Bioventing of Soil and Air Sparging of Plume** | **RA25-3A Bioventing of Soil and Natural Attenuation of Plume** | **RA25-4 Source Removal, Off-site Disposal, and Long-Term Monitoring of Plume** | **RA25-5 Source Removal, Off-site Disposal, and Air Stripping of Plume** | **RA25-6 Source Removal, Off-site Disposal, and Air Sparging of Plume** | **RA25-3R Bioventing of Soil, Air Sparging of Plume and Sediment Removal (1 ditch)** | **RA25-3AR Bioventing of Soil, Natural Attenuation of Plume and Sediment Removal (1 ditch)** | **RA25-4R Source Removal, Off-site Disposal, Long-term Monitoring of Plume, and Sediment (1ditch)** |
| **Long-Term Effectiveness and Permanence** | | | | | | | | | | |
| Magnitude of Residual Risk | Residual risk will exist for a relatively long period of time, until plume naturally degrades | Residual risk will exist for a relatively long period of time because source remains in place, constituents in source and plume will naturally degrade | No residual risk will exist; soil and groundwater will be treated until they meet treatment criteria | No residual risk will exist; soil and groundwater will be treated until they meet treatment criteria | No residual risk will exist on-site; groundwater will be monitored until it meets GA standard. Soil disposal will be off-site so there may be some associated residual risk of exposure. Some volatile constituents will be lost during excavation and biodegradation will continue to occur at the off-site disposal area. | No residual risk will exist on-site; groundwater will be treated until it meets treatment criteria. Soil disposal will be off-site so there may be some associated residual risk of exposure. Some volatile constituents will be lost during excavation and biodegradation will continue to occur at the off-site disposal area. | No residual risk will exist on-site; groundwater will be treated until it meets treatment criteria. Soil disposal will be off-site so there may be some associated residual risk of exposure. Some volatile constituents will be lost during excavation and biodegradation will continue to occur at the off-site disposal area. | No residual risk will exist; soil and groundwater will be treated until they meet treatment criteria | No residual risk will exist; soil and groundwater will be treated until they meet treatment criteria | No residual risk will exist on-site; groundwater will be monitored until it meets GA standard. Soil disposal will be off-site so there may be some associated residual risk of exposure. Some volatile constituents will be lost during excavation and biodegradation will continue to occur at the off-site disposal area. |
| Permanence | Not permanent, but will be permanent once natural mechanisms reduce concentrations | Not permanent, but will be permanent once natural mechanisms reduce concentrations | Once treatment criteria of <1 ug/L (benzene) in groundwater is attained the action is permanent | Once treatment criteria of <1 ug/L (benzene) in groundwater is attained the action is permanent | Excavation and off-site disposal of source soils is not permanent. Once treatment criteria of <1 ug/L (benzene) in groundwater is attained the action is permanent for ground water | Excavation and off-site disposal of source soils is not permanent. Once treatment criteria of <1 ug/L (benzene) in groundwater is attained the action is permanent for ground water | Excavation and off-site disposal of source soils is not permanent. Once treatment criteria of <1 ug/L (benzene) in groundwater is attained the action is permanent for ground water | Once treatment criteria of <1 ug/L (benzene) in groundwater is attained the action is permanent | Once treatment criteria of <1 ug/L (benzene) in groundwater is attained the action is permanent | Excavation and off-site disposal of source soils is not permanent. Once treatment criteria of <1ug/L (benzene) in groundwater is attained the action is permanent for groundwater |
| **Reduction of Toxicity, Mobility, or Volume Through Treatment** | Any reduction will not be documented | Any reduction in soil and groundwater concentrations due to natural degradation will be documented via long term monitoring | Effective: constituents of concern in soil and groundwater are removed or destroyed | Effective: constituents of concern in soil and groundwater are removed or destroyed | Moderately Effective: constituents of concern in groundwater are removed or destroyed; in soil no significant reduction in toxicity because it is excavated and landfilled. | Moderately Effective: constituents of concern in groundwater are removed or destroyed; in soil no significant reduction in toxicity because it is excavated and landfilled | Moderately Effective: constituents of concern in groundwater are removed or destroyed; in soil no significant reduction in toxicity because it is excavated and landfilled. | Effective: constituents of concern in soil and groundwater are removed or destroyed | Effective: constituents of concern in soil and groundwater are removed or destroyed | Moderately Effective: constituents of concern in groundwater are removed or destroyed; in soil no significant reduction in toxicity because it is excavated and landfilled |

Table 4
Summary of Detailed Evaluation of Alternatives
Proposed Plan for SEAD-25
Seneca Army Depot Activity

| | Industrial | | | | | | | Residential | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Criteria** | **RA25-1 No Action** | **RA25-2 Institutional Controls and Natural Attenuation of Plume** | **RA25-3 Bioventing of Soil and Air Sparging of Plume** | **RA25-3A Bioventing of Soil and Natural Attenuation of Plume** | **RA25-4 Source Removal, Off-site Disposal, and Long-Term Monitoring of Plume** | **RA25-5 Source Removal, Off-site Disposal, and Air Stripping of Plume** | **RA25-6 Source Removal, Off-site Disposal, and Air Sparging of Plume** | **RA25-3R Bioventing of Soil, Air Sparging of Plume and Sediment Removal (1 ditch)** | **RA25-3AR Bioventing of Soil, Natural Attenuation of Plume and Sediment Removal (1 ditch)** | **RA25-4R Source Removal, Off-site Disposal, Long-term Monitoring of Plume, and Sediment (1ditch)** |
| **Short-Term Effectiveness (Impact of Implementation of Alternative)** | | | | | | | | | | |
| Community Protection | No action is proposed. Impacts to community will be no greater than under current conditions. Future receptor risks are above acceptable ranges | Protective - the institutional controls (e.g., installation of fencing) and natural attenuation will have no added impacts on the community | Protective - air emissions from bioventing and sparging eliminated via carbon, will comply with air quality standards | Protective - air emissions from bioventing eliminated via carbon, will comply with air quality standards. Natural attenuation has no added impact on community | Protective - during excavation, air monitoring will be performed at site boundaries to ensure that there are no community impacts. Long term monitoring has no added impact on community. | Protective - during excavation, air monitoring will be performed at site boundaries to ensure that there are no community impacts. Air emissions from stripping will be eliminated via carbon, will comply with air quality standards. | Protective - during excavation, air monitoring will be performed at site boundaries to ensure that there are no community impacts. Air emissions from sparging will be eliminated via carbon, will comply with air quality standards. | Protective - air emissions from bioventing and sparging eliminated via carbon, will comply with air quality standards | Protective - air emissions from bioventing eliminated via carbon, will comply with air quality standards. Natural attenuation has no added impact on community. | Protective - during excavation, air monitoring will be performed at site boundaries to ensure that there are no community impacts. Long term monitoring has no added impact on community. |
| Worker Protection | No action is proposed. Impacts to workers will be no greater than under current conditions. Current site worker risk is within acceptable ranges | Protective - the institutional controls (e.g., installation of fencing) and natural attenuation will have no added impacts on the workers, since any fencing would be installed outside the impacted areas. | Protective - dust produced during construction will be eliminated via standard dust suppression methods and workers will wear personal protective equipment | Protective - dust produced during construction will be eliminated via standard dust suppression methods and workers will wear personal protective equipment | Protective - dust produced during excavation will be eliminated via standard dust suppression methods and workers will wear personal protective equipment, which will also protect against inhalation of volatiles in air. | Protective - dust produced during excavation will be eliminated via standard dust suppression methods and workers will wear personal protective equipment, which will also protect against inhalation of volatiles in air. | Protective - dust produced during excavation will be eliminated via standard dust suppression methods and workers will wear personal protective equipment, which will also protect against inhalation of volatiles in air. | Protective - dust produced during construction will be eliminated via standard dust suppression methods and workers will wear personal protective equipment | Protective - dust produced during construction will be eliminated via standard dust suppression methods and workers will wear personal protective equipment | Protective -dust produced during excavation will be eliminated via standard dust suppression methods and workers will wear personal protective equipment, which will also protect against inhalation of volatiles in air. |
| Environmental Impacts | No action is proposed. Current, short-term conditions are protective of environment | Current, short-term conditions are protective of environment | Current, short-term conditions are protective of environment | Current, short-term conditions are protective of environment | Current, short-term conditions are protective of environment. During excavation, measures to protect impacts to surface water and sediment will be used (e.g., silt fences) | Current, short-term conditions are protective of environment. During excavation, measures to protect impacts to surface water and sediment will be used (e.g., silt fences) | Current, short-term conditions are protective of environment. During excavation, measures to protect impacts to surface water and sediment will be used (e.g., silt fences) | Current, short-term conditions are protective of environment; sediment removal from one ditch will temporarily disrupt any ecological communities | Current, short-term conditions are protective of environment; sediment removal from one ditch will temporarily disrupt any ecological communities | Current, short-term conditions are protective of environment. During excavation, measures to protect impacts to surface water and sediment will be used Sediment removal from one ditch will temporarily disrupt any ecological communities |
| Time Until Action is Complete | No action is performed. Not applicable. | Estimated to be 150 years for monitoring of plume | Estimated to be 5 years for bioventing of source area and 10 years for monitoring of plume | Estimated to be 5 years for bioventing of source area and 15 years for monitoring of plume | Estimated to be 10 years for monitoring of plume | Estimated to be 1 years for air stripping of plume and 5 years for monitoring | Estimated to be 10 years for sparging of plume and 10 years of monitoring | Estimated to be 5 years for bioventing source area and 10 years for monitoring the plume | Estimated to be 5 years for bioventing source area and 15 years for monitoring the plume | Estimated to be 10 years for monitoring of plume |

Table 4
Summary of Detailed Evaluation of Alternatives
Proposed Plan for SEAD-25
Seneca Army Depot Activity

| | Industrial | | | | | | | Residential | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Criteria | RA25-1 No Action | RA25-2 Institutional Controls and Natural Attenuation of Plume | RA25-3 Bioventing of Soil and Air Sparging of Plume | RA25-3A Bioventing of Soil and Natural Attenuation of Plume | RA25-4 Source Removal, Off-site Disposal, and Long-Term Monitoring of Plume | RA25-5 Source Removal, Off-site Disposal, and Air Stripping of Plume | RA25-6 Source Removal, Off-site Disposal, and Air Sparging of Plume | RA25-3R Bioventing of Soil, Air Sparging of Plume and Sediment Removal (1 ditch) | RA25-3AR Bioventing of Soil, Natural Attenuation of Plume and Sediment Removal (1 ditch) | RA25-4R Source Removal, Off-site Disposal, Long-term Monitoring of Plume, and Sediment (1ditch) |
| **Implementability** | | | | | | | | | | |
| Technical Feasibility | No action is performed, and nothing is implemented. Not applicable. | Feasible - reductions from natural attenuation are occurring based on site data and will continue to occur | Feasible - some uncertainty because bioventing and sparging of plume will require field-scale pilot testing to show it can reduce concentrations | Feasible - some uncertainty for bioventing, which will require field scale pilot testing; natural attenuation of plume will continue to reduce concentrations | Feasible - excavation and groundwater monitoring are easily implemented | Feasible - excavation is easily implemented; air stripping is a proven technology for removing volatiles from groundwater. | Feasible - excavation is easily implemented; air sparging is a proven technology to remove volatile from groundwater | Feasible - some uncertainty because bioventing and sparging of plume will require field-scale pilot testing to show it can reduce concentrations; there is no uncertainty with sediment removal | Feasible - some uncertainty for bioventing, which will require field scale pilot testing; natural attenuation of plume will continue to reduce concentrations; there is no uncertainty with sediment removal | Feasible - excavation and groundwater monitoring are easily implemented; there is no uncertainty with sediment removal |
| Ease of Doing More Action if Needed | No action is performed. Not applicable. | Least interference - the institutional controls would not prevent required future action | Minor Interference - the bioventing and sparging systems will have some impact on available space for future action, but would not prevent required future action | Minor Interference - the bioventing system will have some impact on available space for future action, but would not prevent required future action | Least interference - excavation would be performed but it would not prevent required future action | Minor interference - excavation would be performed but it would not prevent required future action, but air stripping equipment would potentially limit surface availability, but would also not prevent future action. | Minor interference - excavation would be performed but it would not prevent required future action, but air stripping equipment would potentially limit surface availability | Minor Interference - the bioventing and sparging systems will have some impact on available space for future action, but would not prevent required future action. | Minor Interference - the bioventing system will have some impact on available space for future action, but would not prevent required future action | Least interference - excavation would be performed but it would not prevent required future action |
| Ability to Obtain Approvals and Coordinate with Other Agencies | Requires agency approvals. | Requires agency approvals - monitoring plan (NYSDEC and EPA) | Requires agency approvals - final remedy selection and monitoring plan (NYSDEC and EPA) | Requires agency approvals - final remedy selection and monitoring plan (NYSDEC and EPA) | Requires agency approvals - off-site disposal of excavated material, monitoring plan (NYSDEC and EPA) | Requires agency approvals - off-site disposal of excavated material, possible air permit for stripping system, and monitoring plan (NYSDEC and EPA) | Requires agency approvals - off-site disposal of excavated material, possible air permit for sparging system, and monitoring plan (NYSDEC and EPA) | Requires agency approvals - final remedy selection and monitoring plan (NYSDEC and EPA) | Requires agency approvals - final remedy selection and monitoring plan (NYSDEC and EPA) | Requires agency approvals - off-site disposal of excavated material, monitoring plan (NYSDEC and EPA) |
| Availability of Services and Materials | No services are required | All services required to undertake a monitoring program are available | Material and services are available. All equipment required is standard | Material and services are available. All equipment required is standard | Material and services are available. All equipment required is standard | Material and services are available. All equipment required is standard | Material and services are available. All equipment required is standard | Material and services are available. All equipment required is standard | Material and services are available. All equipment required is standard | Material and services are available. All equipment required is standard. |
| **Cost (4)** | | | | | | | | | | |
| Capital | $ - | $38,100 | $373,500 | $236,400 | $659,800 | $716,700 | $682,100 | $422,300 | $285,200 | $701,000 |
| Annual O $ M | $ - | $76,300 | $104,200 | $104,200 | $68,100 | $86,700 | $102,800 | $101,300 | $101,300 | $65,100 |
| Operating Life in Years | 0 | 150-monit. | 5-bv, 10-monit. | 5-bv, 15-monit. | 1-strip, 10-monit. | 1-strip, 5-monit. | 10-sparg, 10-monit. | 5-bv, 10-monit. | 5-bv, 15-monit. | 1-strip, 10-monit. |
| Operating Life Present Worth O & M Cost | $ - | $1,526,400 | $710,000 | $912,800 | $456,000 | $340,800 | $793,700 | $687,200 | $882,100 | $432,800 |
| Total Present Worth Cost (Assumes 5% interest) | $ - | $1,564,500 | $1,083,500 | $1,149,200 | $1,115,800 | $1,057,500 | $1,475,800 | $1,109,500 | $1,167,300 | $1,133,800 |

Table 4
Summary of Detailed Evaluation of Alternatives
Proposed Plan for SEAD-25
Seneca Army Depot Activity

| | Industrial | | | | | | | Residential | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Criteria** | **RA25-1 No Action** | **RA25-2 Institutional Controls and Natural Attenuation of Plume** | **RA25-3 Bioventing of Soil and Air Sparging of Plume** | **RA25-3A Bioventing of Soil and Natural Attenuation of Plume** | **RA25-4 Source Removal, Off-site Disposal, and Long-Term Monitoring of Plume** | **RA25-5 Source Removal, Off-site Disposal, and Air Stripping of Plume** | **RA25-6 Source Removal, Off-site Disposal, and Air Sparging of Plume** | **RA25-3R Bioventing of Soil, Air Sparging of Plume and Sediment Removal (1 ditch)** | **RA25-3AR Bioventing of Soil, Natural Attenuation of Plume and Sediment Removal (1 ditch)** | **RA25-4R Source Removal, Off-site Disposal, Long-term Monitoring of Plume, and Sediment (1ditch)** |
| **State Acceptance** | Will be documented in the ROD | Will be documented in the ROD | Will be documented in the ROD | Will be documented in the ROD | Will be documented in the ROD | Will be documented in the ROD | Will be documented in the ROD | Will be documented in the ROD | Will be documented in the ROD | Will be documented in the ROD |
| **Community Acceptance** | Will be documented in the ROD | Will be documented in the ROD | Will be documented in the ROD | Will be documented in the ROD | Will be documented in the ROD | Will be documented in the ROD | Will be documented in the ROD | Will be documented in the ROD | Will be documented in the ROD | Will be documented in the ROD |

Notes:
(1) Risk values are for the following receptors - **current site worker, future site residents (child and adult)**, and **future site construction worker**
(2) Risk is a maximum - the risk for this scenario was not recalculated due to EPCs that were based on 95th UCLs that were higher than the maximum value detected on site
(3) Some risk values are different than shown in the FS, EPCs were adjusted because in some instances they were based on 95th UCLs that were higher than the maximum value detected on-site.
(4) Note the costs are revised relative to those shown in the FS. Refer to Appendix A for cost backup.

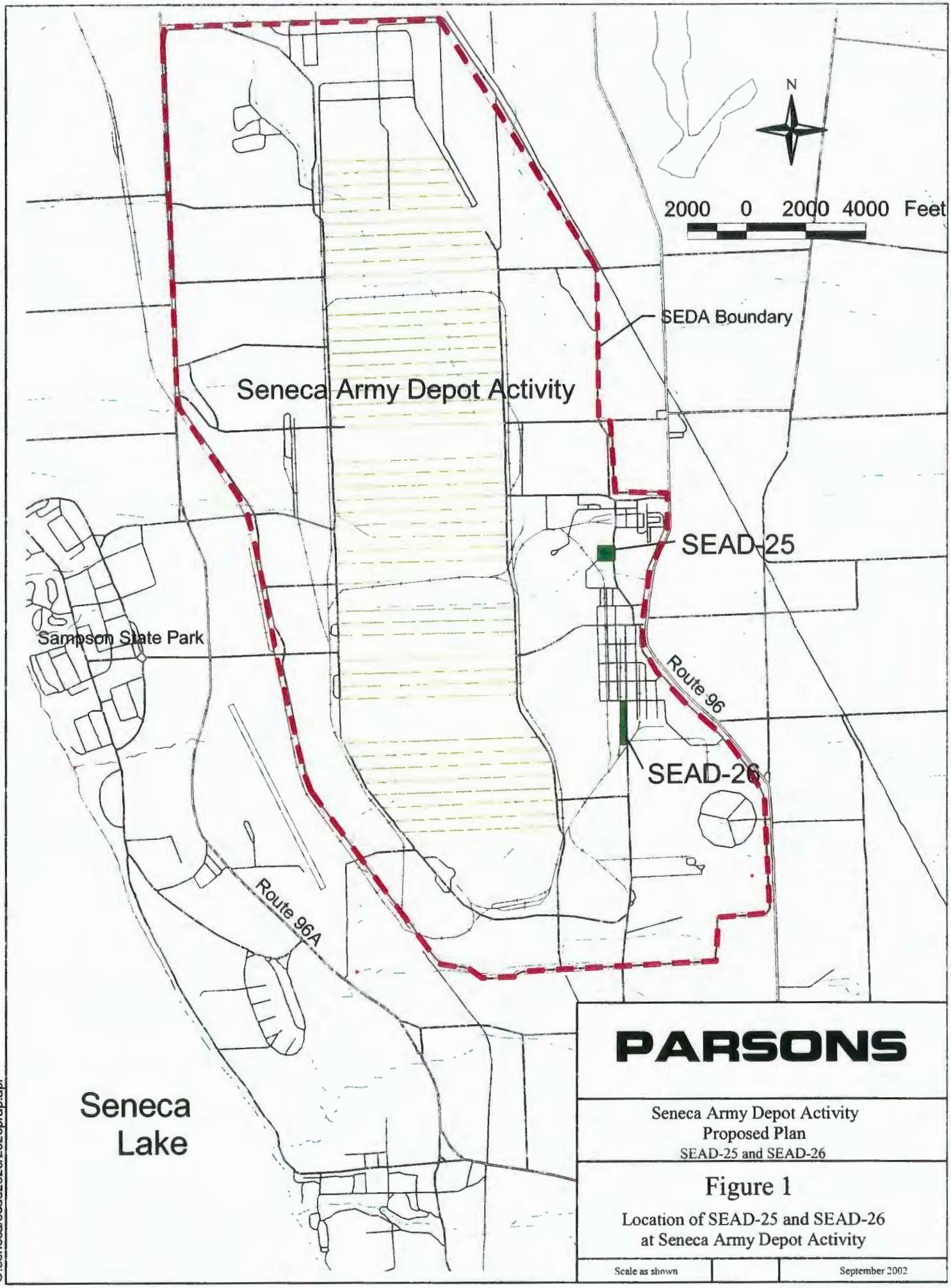
**Table 5**
**Summary of Detailed Evaluation of Alternatives**
**Proposed Plan for SEAD-26**

| Criteria | Industrial | | | |
|---|---|---|---|---|
| | **RA26-1**<br>**No Action** | **RA26-2**<br>**Institutional Controls and Monitoring of Plume** | **RA26-3**<br>**Air Sparging of Plume** | **RA26-4**<br>**Air Stripping of Plume** |
| **Protectiveness of Human Health and the Environment** | | | | |
| Human Health Protection ( EPA target range $1x10^{-4}$ to $1x10^{-6}$ for carcinogenic risks and HI < 1.0 for noncarcinogenic risk) | Sum of risks... | Sum of risks remaining after implementation of alternative... | Sum of risks remaining after implementation of alternative... | Sum of risks remaining after implementation of alternative... |
| carcinogenic risk (1) | $1x10^{-6}$, $7x10^{-5}$, $2x10^{-6}$ | Not calculated because current risks are below targets for intended future use | Not calculated because current risks are below targets for intended future use | Not calculated because current risks are below targets for intended future use |
| noncarcinogenic risk - HI (1) | 0.004, 1 (child) and 0.4 (adult), 0.4 | Not calculated because current risks are below targets for intended future use | Not calculated because current risks are below targets for intended future use | Not calculated because current risks are below targets for intended future use |
| Exposure Pathways | Protective - risks are acceptable | Protective - risk are acceptable. Groundwater will be restricted until acceptable levels area achieved. | Protective: groundwater exposure is eliminated via air sparging. | Protective: groundwater exposure is eliminated via air stripping. |
| Protection of Ecological Receptors | Protective - depth to groundwater prevents ecological exposure; current ecological risk is negligible | Protective - depth to groundwater prevents ecological exposure; current ecological risk is negligible | Protective - depth to groundwater prevents ecological exposure; current ecological risk is negligible | Protective - depth to groundwater prevents ecological exposure; current ecological risk is negligible |
| **Compliance with ARARs** | Not Compliant with ARARS | Compliant with ARARs, but will require a relatively long period of time to meet remediation standards | Will Comply with all ARARs | Will Comply with all ARARs |
| **Long-Term Effectiveness and Permanence** | | | | |
| Magnitude of Residual Risk | Residual risk will exist for a relatively long period, but they will biodegrade over time; current risks are below the EPA targets | Some residual risk will exist, for a relatively long period of time as the plume degrades naturally; current risks are below the EPA targets | No residual risk will exist; groundwater in the one on-site well will be treated by sparging; current risks are below the EPA targets | No residual risk will exist; groundwater in the one on-site well will be pumped out and treated by air stripping; current risks are below the EPA targets. |
| Permanence | Will be permanent once natural mechanisms reduce concentrations | Will be permanent once natural mechanisms reduce concentrations | Once treatment criteria of <1 ug/L (benzene) is attained the action is permanent | Once treatment criteria of <1 ug/L (benzene) is attained the action is permanent |
| **Reduction of Toxicity, Mobility, or Volume Through Treatment** | Any reduction will not be documented | Any reduction in soil and groundwater concentrations due to natural degradation will be documented via long-term monitoring | Effective: constituents in groundwater near the impacted well are removed or destroyed | Effective: constituents in groundwater near the impacted well are removed or destroyed |
| **Short-Term Effectiveness** | | | | |
| Community Protection | No action is proposed. Impacts to community will be no greater than under current conditions. Future receptor risks are above acceptable ranges | Protective - the institutional controls and natural degradation of contaminants will have no added impacts on the community | Protective: because the air sparging will be done in the well with relatively low VOC concentrations, there is not a need for vapor recovery and off-gas treatment; current risk is within acceptable ranges | Protective: because the groundwater to be treated by air stripping has a low VOC concentrations, there is not a need for vapor recovery and off-gas treatment; current risk is within acceptable ranges |

**Table 5**
**Summary of Detailed Evaluation of Alternatives**
**Proposed Plan for SEAD-26**

| Criteria | Industrial | | | |
|---|---|---|---|---|
| | **RA26-1 No Action** | **RA26-2 Institutional Controls and Monitoring of Plume** | **RA26-3 Air Sparging of Plume** | **RA26-4 Air Stripping of Plume** |
| Worker Protection | No action is proposed. Impacts to workers will be no greater than under current conditions. Current site worker risk is within acceptable ranges | Protective - the institutional controls and natural degradation of contaminants will have no added impacts on the workers. | Protective: workers installing the small sparging unit will wear personal protective equipment: current risk is within acceptable ranges | Protective: workers installing the small stripping unit will wear personal protective equipment: current risk is within acceptable ranges |
| Environmental Impacts | No action is proposed. Current, short-term conditions are protective of environment | Current, short-term conditions are protective of environment | Current, short-term conditions are protective of environment | Current, short-term conditions are protective of environment; water that is pumped from the well and treated by stripping will pass through a carbon polish before being discharged to nearby drainage ditches. |
| Time Until Action is Complete | No action is performed. Not applicable. | Estimated to be 20 years for monitoring of plume | Estimated to be 10 years for sparging and monitoring of plume | Estimated to be 10 years for air stripping and monitoring of plume |
| **Implementability** | | | | |
| Technical Feasibility | No action is performed and nothing is implemented. Not applicable. | Feasible - reductions from natural degradation are occurring and will continue to occur | Feasible - sparging has been shown to be proven technology for treating volatile organic compounds in groundwater. | Feasible - air stripping has been shown to be proven technology for treating volatile organic compounds in groundwater. |
| Ease of Doing More Action if Needed | No action is performed. Not applicable. | Least interference - nothing would be done to prevent required future action | Very Minor Interference - the sparging system will have very little impact on available space for future action | Very Minor Interference - the air stripping system will have very little impact on available space for future action |
| Ability to Obtain Approvals and Coordinate with Other Agencies | Requires agency approvals. | Requires agency approvals - monitoring plan (NYSDEC and EPA) | Requires agency approvals - final remedy selection and monitoring plan (NYSDEC and EPA) | Requires agency approvals - final remedy selection and monitoring plan (NYSDEC and EPA) |
| Availability of Services and Materials | No services are required | All services required to undertake a monitoring program are available | Material and services area available. All equipment required is standard | Material and services area available. All equipment required is standard |
| Cost (2) | | | | |
| Capital | $ - | $72,300 | $299,800 | $340,200 |
| Annual O $ M | $ - | $25,400 | $51,200 | $57,400 |
| Operating Life in Years | 0 | 20-mon. | 10-sparg., 10-mon. | 10-strip., 10-mon. |
| Operating Life Present Worth O & M Cost | $ - | $316,700 | $395,200 | $443,400 |
| Total Present Worth Cost (Assumes 5% interest) | $ - | $389,000 | $695,000 | $783,600 |
| **State Acceptance** | Will be documented in the ROD | Will be documented in the ROD | Will be documented in the ROD | Will be documented in the ROD |
| **Community Acceptance** | Will be documented in the ROD | Will be documented in the ROD | Will be documented in the ROD | Will be documented in the ROD |

Notes:
(1) Risk values are for the following receptors - **current site worker, future site residents (child and adult)**, and **future site construction worker**.
(2) Note the costs are revised relative to those shown in the FS (see text of PRAP for explanations)




PARSONS

Seneca Army Depot Activity
Proposed Plan
SEAD-25 and SEAD-26

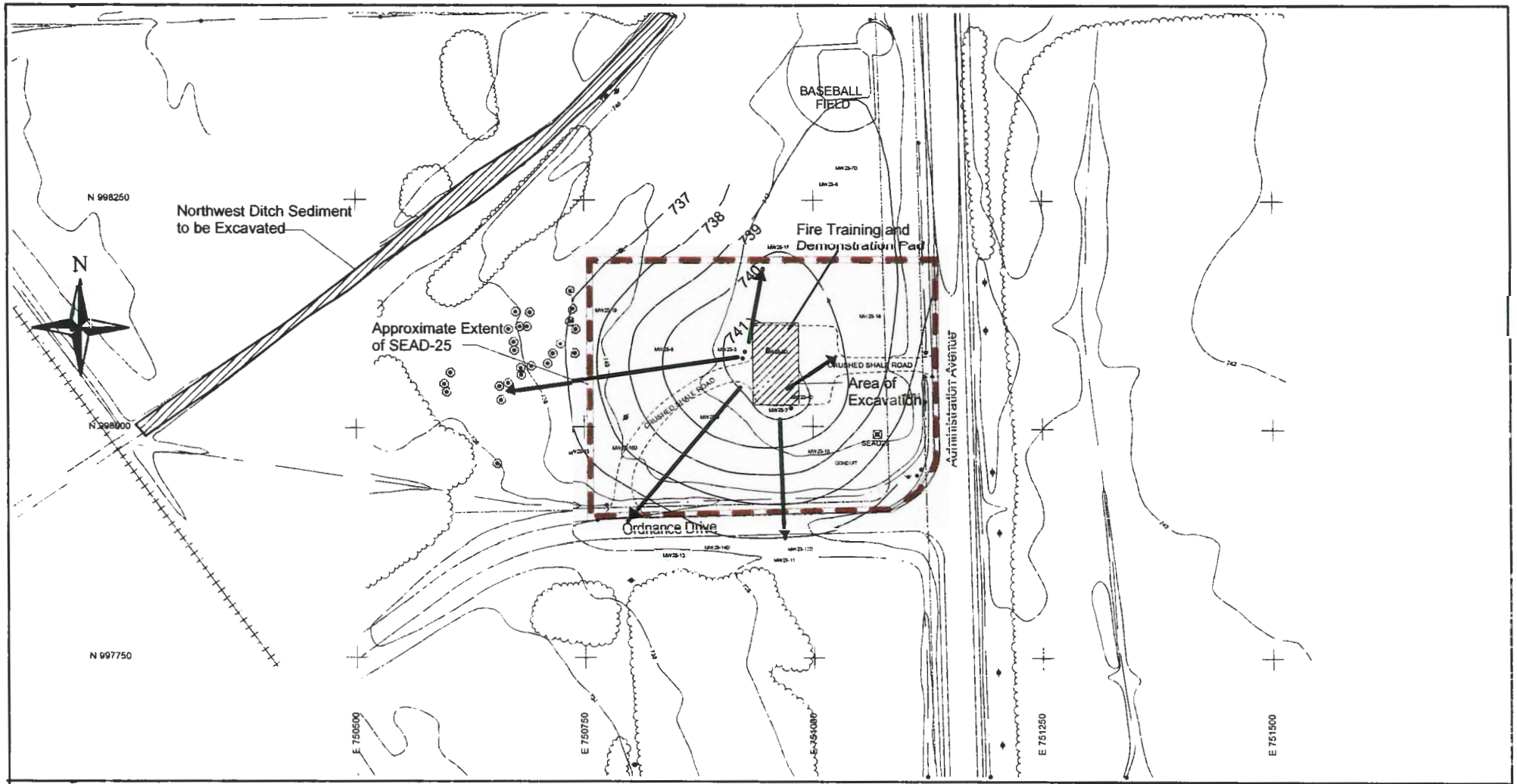
# Figure 1

Location of SEAD-25 and SEAD-26
at Seneca Army Depot Activity

| Scale as shown | | September 2002 |
|---|---|---|

O:seneca/sead2526/2526prap.apr

O:/seneca/Sead2526/2526prap.apr




100 0 100 200 Feet

LEGEND

- Area of Excavation
- Groundwater Contour Lines (ft)
- Groundwater Flow Direction
- Monitoring Well
- Telephone Pole
- Benchmark
- Road
- Water Line
- Electrical Line

PARSONS

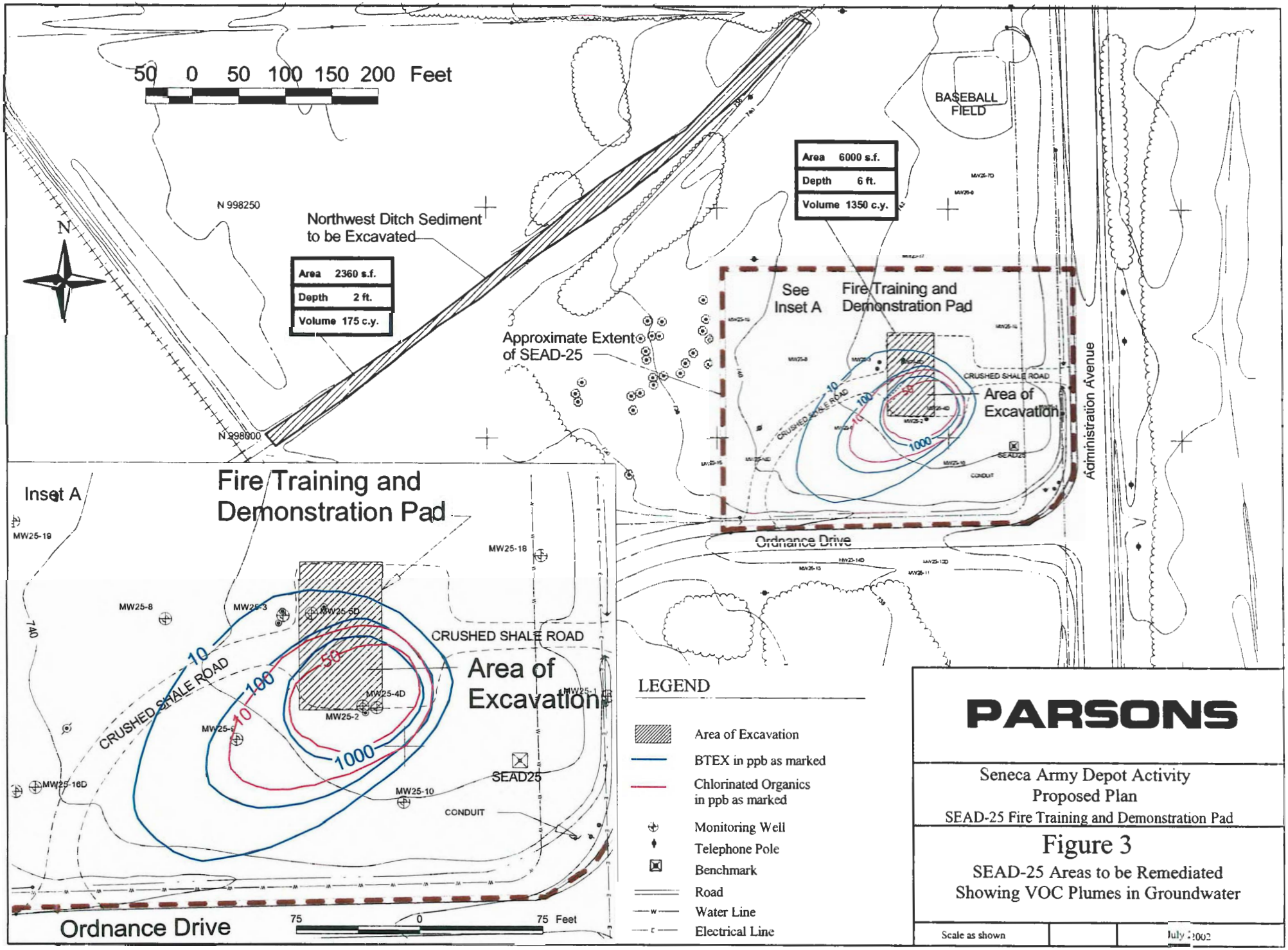
Seneca Army Depot Activity
Proposed Plan
SEAD-25 Fire Training and Demonstration Pad

# Figure 2

SEAD-25 Areas to be Remediated
Showing Groundwater Flow
Direction and Elevations

| Scale as shown | | July 2002 |
|---|---|---|

O:/seneca/sead2526/2526prap.apr



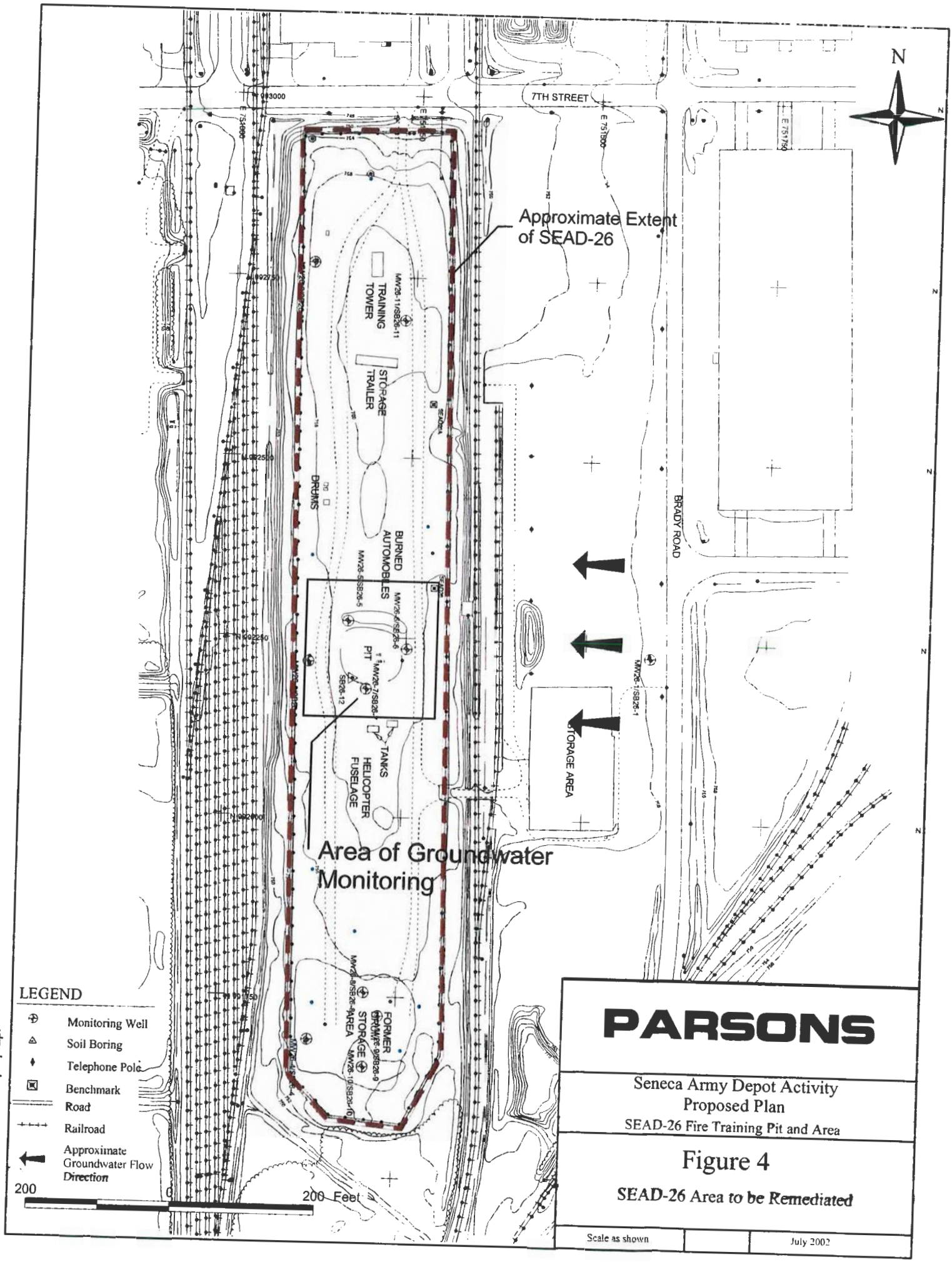

PARSONS

Seneca Army Depot Activity
Proposed Plan
SEAD-25 Fire Training and Demonstration Pad

# Figure 3

SEAD-25 Areas to be Remediated
Showing VOC Plumes in Groundwater

| Scale as shown | | July 2002 |
|---|---|---|




O:seneca/Sead2526/2526prap.apr

# PARSONS

Seneca Army Depot Activity
Proposed Plan
SEAD-26 Fire Training Pit and Area

## Figure 4

**SEAD-26 Area to be Remediated**

| Scale as shown | | July 2002 |
|---|---|---|